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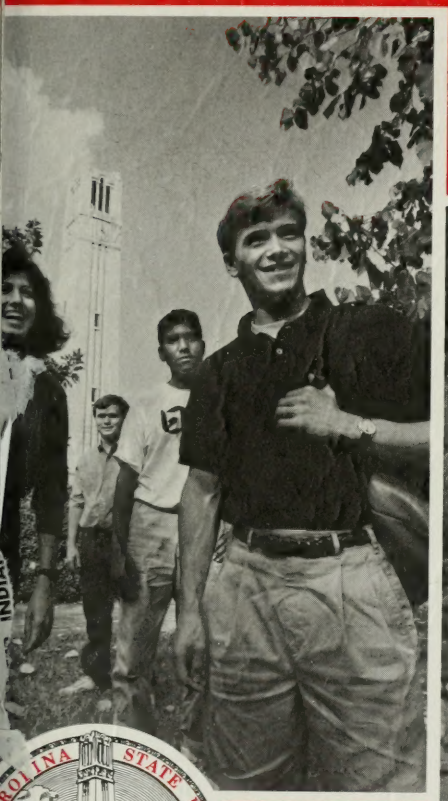
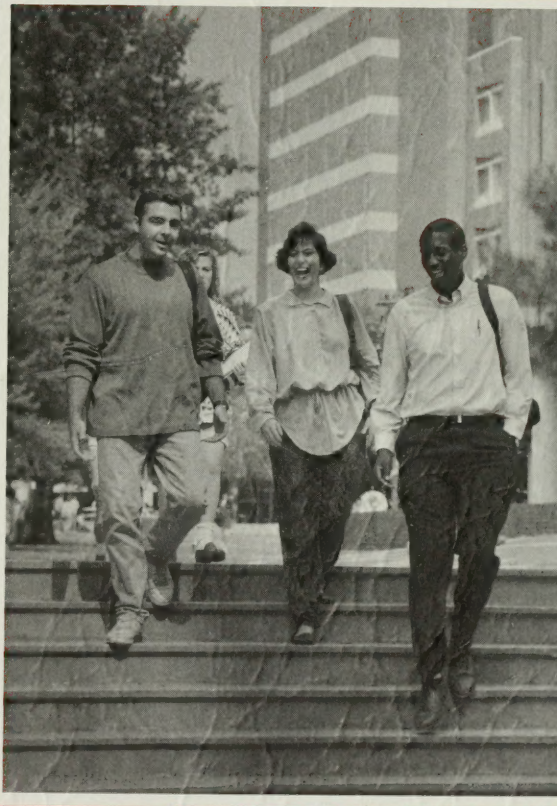
North Carolina State University





BULLETIN

Undergraduate Catalog

1991 - 1993

This catalog is intended for informational purposes only. Requirements, rules, procedures, courses and informational statements set forth herein are subject to change. Notice of changes will be conveyed to duly enrolled students and other appropriate persons at the time such changes are effected.

NORTH CAROLINA STATE UNIVERSITY BULLETIN

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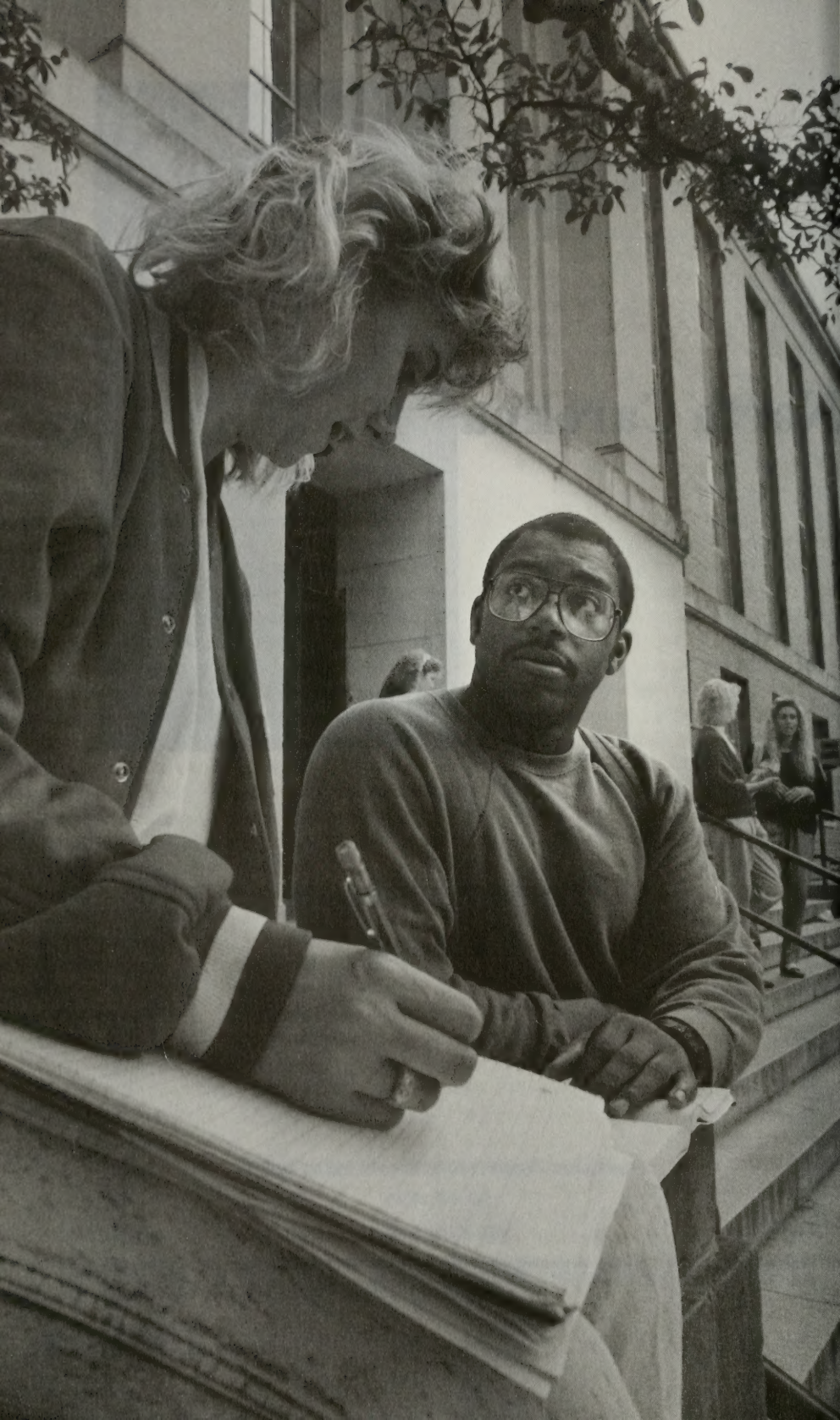
North Carolina State University

Undergraduate Catalog

1991-93



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Contents

North Carolina State University 5
NCSU Administration and Offices 8
Academic Calendar 11
Academic Fields of Study and Degrees 15
Natural Resources Curricula 21
Arts Studies 22
Honors and Scholars Programs 23
Scholarships 24
Special Academic Programs 26
International Programs and Activities 30
Admissions 34
Orientation 39
Registration 40
Tuition and Fees 41
Financial Aid 46
Student Housing 48
Academic Policies and Procedures 50
Code of Conduct 65
Student Services 65
Student Activities 69
Programs of Study 75
College of Agriculture and Life Sciences 79
School of Design 129
College of Education and Psychology 138
College of Engineering 166
College of Forest Resources 199
College of Humanities and Social Sciences 217
College of Physical and Mathematical Sciences 244
College of Textiles 262
College of Veterinary Medicine 279
Music Department 282
Military Education and Training 282
Graduate School 286
Adult Credit Programs and Summer Sessions 287
University Extension and Public Service 287
University Libraries 290
University Computing 291
Research Triangle 291
Research Centers and Facilities 292
University Development 300
University Relations 302
The Alumni Association 303
Course Descriptions 314
The University of North Carolina 493
Historical Sketch of NCSU 495

NCSU Role and Mission Statement 497
Policy on Illegal Drugs 499
NCSU Board of Trustees 502
NCSU Administrative Council 502
NCSU Faculty and Other Academic Personnel 503
NCSU Emeritus Faculty 546
Index 554
Campus Map 560

Above is an aerial view of the central campus of North Carolina State University viewed east to west. The strong diagonal in the foreground is Hillsborough Street, which forms the north border. In the lower left is the Memorial Tower, a prominent landmark which commemorates World War I dead.

Dr. Larry K. Monteith is North Carolina State University's eleventh chancellor.

North Carolina State University

North Carolina State University is a national center for research, teaching, and extension in the sciences and technologies, in the humanities and social sciences, and in a wide range of professional programs.

Founded March 7, 1887, by the North Carolina General Assembly under the provisions of the national Land-Grant Act, the University has marked more than a century of service to the state and the nation. Sharing the distinctive character of Land-Grant universities nationwide, North Carolina State University has broad academic offerings, national and international linkages, and large-scale public service, extension, and research activities.

The university is organized into eight colleges, the School of Design, and the Graduate School. The colleges are Agriculture and Life Sciences, Education and Psychology, Engineering, Forest Resources, Humanities and Social Sciences, Physical and Mathematical Sciences, Textiles, and Veterinary Medicine. These colleges and schools offer baccalaureate degrees in 89 fields, master's degrees in 77 fields, and doctoral degrees in 48 fields. Together with more than 30 research centers and institutes, these colleges and schools also support a broad spectrum of more than 1,200 scientific, technological, and scholarly research endeavors.

Extension units carry teaching and research programs to each of North Carolina's 100 counties and the Cherokee Indian Reservation. Extension credit courses were delivered live and by cable, video, and satellite to 34 states and the District of Columbia, as well as to England, France, Spain, Switzerland, Mexico, Canada, Cyprus, and New Zealand.

The central campus of the University, located west of the downtown area of Raleigh, consists of 145 major buildings on 700 acres. Adjacent to the central campus are the new 940-acre Centennial Campus and the College of Veterinary Medicine campus. Nearby are research farms; biology and ecology sites; genetics, horticulture, and floriculture nurseries; forests; and Carter-Finley Stadium that together comprise 2,700 acres. Elsewhere across the state are research farms, a research forest of 82,000 acres, and the Chinqua-Penn Plantation.

North Carolina State University is one of the three Research Triangle universities along with Duke University in Durham and the University of North Carolina at Chapel Hill. Within the 30-mile triangle formed by the three universities is the 5,000-acre Research Triangle Park, location of many public research agencies and private research centers of national and international corporations. The Triangle Universities Computation Center, a central facility for the extensive computing activities of the universities, also is located in the Park.

The University has approximately 8,200 employees. Faculty and other academic personnel total 2,686, including 1,834 graduate faculty. Among the many honors and recognitions received by members of the faculty are seven memberships in the National Academy of Science and four in the National Academy of Engineering, 37 named professorships, 19 university distinguished professorships, 57 Alumni Distinguished Professors, and currently over 200 members of the Academy of Outstanding Teachers.

In the 1990 fall semester, the University's headcount enrollment totaled 26,683. Included in this number were 18,294 students in undergraduate degree programs, 4,142 in graduate degree programs, and 4,247 life-long education students. The combined undergraduate and graduate enrollments by college were: Agriculture and Life Sciences—3,371; Design—594; Education and Psychology—1,494; Engineering—7,243; Forest Resources—678; Humanities and Social Sciences—5,875; Physical and Mathematical Sciences—1,199; Textiles—846; and Veterinary Medicine—326. There were 351 students in the University Undesignated Program, 158 in the University Transition Program, and 301 in the two-year Agriculture Institute Program. The total student population included 2,332 African-American students; 1,032 other minority students, and 10,473 female students. Students at the University come from 48 states, three U.S. territories, and approximately 90 foreign countries. The international enrollment is a distinctive feature of the institution as more than 1,100 international students give the campus a cosmopolitan atmosphere.

Each year the University provides its students with a wide range of opportunities for exposure to the arts. These include the Friends of the College concert series in Reynolds Coliseum; the professional music, theatre, dance, and film series offered by Stewart Theatre; a series of exhibitions of painting, photography, textiles, and sculpture in the galleries of the University Student Center; and a Musician-in-Residence program that brings an artist to the campus each year for formal and informal performances and interaction with students.

The University's "Wolfpack" athletic teams are well-known nationally. The men's basketball team won national championships in 1974 and in 1983 and hold 10 Atlantic Coast Conference titles. The football team has been the Atlantic Coast Conference champion five times, co-champion twice, and has played in 13 bowl games. The Wolfpack women's cross country team won national championships in 1979 and 1980, while the men's and women's soccer teams have both advanced to the NCAA's "final four" in the last five years. The women's basketball team, under the direction of 1988 U.S. Olympic gold-medal winning coach Kay Yow, has played in 10 of 13 ACC title games. The wrestling and men's track teams have each won eight ACC titles while the men's swim team has claimed 23 conference championships. Providing additional color and spirit for the games, the cheerleading squad was twice recognized as national champions. Numerous individual NCSU athletes have won NCAA titles, national championships, and international honors, including medals in the last four Olympic Games in which the United States has competed.

The University is a member of the National Association of State Universities and Land-Grant Colleges, the American Council on Education, the American Council of Learned Societies, the Association of Governing Boards of Universities and Colleges, the Oak Ridge Associated Universities, the International University Consortium for Telecommunications in Learning, the North Carolina Association of Colleges and Universities, and the Cooperating Raleigh Colleges.

North Carolina State University is committed to equality of educational opportunity and does not discriminate against applicants, students, or employees based on race, color, national origin, religion, sex, age, or handicap. Moreover, North Carolina State University is open to people of all races and actively seeks to

promote racial integration by recruiting and enrolling a larger number of African-American students.

ACCREDITATION

North Carolina State University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools. In addition, many of the university's professional programs and departments are accredited by national professional associations, including:

Accreditation Board for Engineering and Technology
American Association for Accreditation of Laboratory Animal Care
American Chemical Society
American Veterinary Medical Association
Computer Science Accreditation Commission
Council on Social Work Education
Landscape Architectural Accrediting Board
National Architectural Accrediting Board
National Association of Schools of Public Affairs and Administration
National Council for Accreditation of Teacher Education
National Recreation and Park Association
Society of American Foresters
Society of Wood Science and Technology

NONDISCRIMINATION POLICY

North Carolina State University is dedicated to equality of opportunity within its community. Accordingly, North Carolina State University does not practice or condone discrimination, in any form, against students, employees, or applicants on the grounds of race, color, national origin, religion, sex, age, or handicap.

North Carolina State University commits itself to positive action to secure equal opportunity regardless of those characteristics.

North Carolina State University supports the protection available to members of its community under all applicable Federal laws, including Titles VI and VII of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Sections 799A and 845 of the Public Health Service Act, the Equal Pay and Age Discrimination Acts, the Rehabilitation Act of 1973, the Vietnam Veteran's Readjustment Assistance Act of 1974, and Executive Order 11246.

For information concerning these provisions, contact:

Lawrence M. Clark
Affirmative Action Officer
201 Holladay Hall
Box 7101
North Carolina State University
Raleigh, North Carolina 27695-7101
Phone: (919) 737-3409 or 737-3148

NCSU Administration and Offices

CHANCELLOR'S OFFICE
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Claude E. McKinney, *Special Assistant to the Chancellor, Centennial Campus*
Karen P. Helm, *Assistant to the Chancellor and Director of University Planning*
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Ronald, J. Kuhr, *Associate Dean and Director, Agricultural Research Service*
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Counseling Center
M. Lee Salter, *Director*
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Study Abroad
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University Student Center
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Upward Bound
Cynthia J. Harris, *Director*
Visual Arts Programs
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Lise Miller, *Director*

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H. Ken DeDominicis, *Associate Vice Chancellor*

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Broadcast Services
Robert S. Cairns, *Director*

ATHLETICS

William T. Turner, *Director*

Academic Calendar

SPRING SEMESTER, 1991

January	9	Weds.	First day of classes
January	16	Weds.	Last day to add a course without permission of instructor
January	21	Mon.	Holiday (Martin Luther King Day)
January	24	Thurs.	Last day to register (includes payment of tuition and fees) or to add a course; last day to withdraw or drop a course with a refund; last day for undergraduate students to drop below 12 hours. *The tuition and fees charge is based on the official number of hours and courses carried at 5:00 p.m. on the day.*
February	7	Thurs.	Last day to withdraw or drop a course at the 400 level or below without a grade; last day to change from credit to audit at the 400 level or below.
February	20	Weds.	Academic Difficulty Reports due.
March	1	Fri.	Spring vacation begins at 10:00 p.m.
March	11	Mon.	Classes resume at 8:05 a.m.
March	15	Fri.	Last day to withdraw or drop a course at the 500 or 600 level
March	18	Mon.	Registration advising for 1991 fall semester begins
March	23	Sat.	TRAC registration opens
March	29	Fri.	Holiday (Good Friday)
April	26	Fri.	Last day of classes
April	29-	Mon.	Final examinations
May	7	Tues.	
May	11	Sat.	Commencement

SUMMER SESSIONS, 1991

First Session

May	21	Tues.	First day of classes
May	22	Weds.	Last day to add a course without permission of instructor
May	27	Mon.	Last day to register (includes payment of tuition and fees) and to add a course; last day to withdraw or drop a course with a refund. *The tuition and fees charge is based on the official number of hours and courses carried at 5:00 p.m. on this day.*
May	31	Fri.	Last day to withdraw or drop a course at the 400 level or below without a grade; last day to change from credit to audit at the 400 level or below; last day to change to credit only
June	7	Fri.	Last day to withdraw or drop a course at the 500 or 600 level
June	21	Fri.	Last day of classes
June	24-25	Mon.-Tues.	Final examinations

Second Session

July	1	Mon.	First day of classes
July	2	Tues.	Last day to add a course without permission of instructor

July	4	Thurs.	Holiday (Independence Day)
July	9	Tues.	Last day to register (includes payment or tuition and fees) and to add a course; last day to withdraw or drop a course with a refund. *The tuition and fees charge is based on the official number of hours and courses carried at 5:00 p.m. on this day.*
July	12	Fri.	Last day to withdraw or drop a course at the 400 level or below without a grade; last day to change from credit to audit at the 400 level or below; last day to change to credit only
July	19	Fri.	Last day to withdraw or drop a course at the 500 or 600 level
August	2	Fri.	Last day of classes
August	5-6	Mon.-Tues.	Final examinations

FALL SEMESTER, 1991

August	21	Weds.	First day of classes
August	28	Weds.	Last day to add a course without permission of instructor
September	2	Mon.	Holiday (Labor Day)
September	5	Thurs.	Last day to register (includes payment of tuition and fees) and to add a course; last day to withdraw or drop a course with a refund; last day for undergraduate students to drop below 12 hours. *The tuition and fees charge is based on the official number of hours and courses carried at 5:00 p.m. on this day.*
September	19	Wed.	Last day to withdraw or drop a course at the 400 level or below without a grade; last day to change from credit to audit at the 400 level or below; last day to change to credit only
October	2	Weds.	Honors convocation (no classes until 12:00 noon)
October	4	Fri.	Academic Difficulty Reports due
October	11	Fri.	Fall vacation begins at 1:00 p.m.
October	16	Weds.	Classes resume at 8:05 a.m.
October	21	Mon.	Registration advising for 1992 spring semester begins
October	25	Fri.	Last day to withdraw or drop a course at the 500 or 600 level
October	26	Sat.	TRAC registration opens
November	26	Tues.	Thanksgiving vacation begins at 10:00 p.m.
December	2	Mon.	Classes resume at 8:05 a.m.
December	6	Fri.	Last day of classes
December	9-17	Mon.-Tues.	Final examinations

SPRING SEMESTER, 1992

January	8	Weds.	First day of classes
January	15	Weds.	Last day to add a course without premission of instructor
January	20	Mon.	Holiday (Martin Luther King Day)

January	23	Thurs.	Last day to register (includes payment of tuition and fees) and to add a course; last day to withdraw or drop a course with a refund; last day for undergraduate students to drop below 12 hours. *The tuition and fees charge is based on the official number of hours and courses carried at 5:00 p.m. on this day.*
February	6	Thurs.	Last day to withdraw or drop a course at the 400 level or below without a gade; last day to change from credit to audit at the 400 level or below; last day to change to credit only
February	19	Wed.	Academic Difficulty Reports due
February	28	Fri.	Spring vacation begins at 10:00 p.m.
March	9	Mon.	Classes resume at 8:05 a.m.
March	13	Fri.	Last day to withdraw or drop a course at the 500 or 600 level
March	23	Mon.	Registration advising for 1992 fall semester begins
March	28	Sat.	TRAC registration opens
April	17	Fri.	Holiday (Good Friday)
April	24	Fri.	Last day of classes
April	27-	Mon.-	Final examinations
May	5	Tues.	
May	9	Sat.	Commencement

SUMMER SESSIONS, 1992

First Session

May	19	Tues.	First day of classes
May	20	Weds.	Last day to add a course without permission of instructor
May	25	Mon.	Last day to register (includes payment of tuition and fees) and to add a course; last day to withdraw or drop a course with a refund. *The tuition and fees charge is based on the official number of hours and courses carried at 5:00 p.m. on this day.*
May	29	Fri.	Last day to withdraw or drop a course at the 400 level or below without a grade; last day to change from credit to audit at the 400 level or below; last day to change to credit only
June	5	Fri.	Last day to withdraw or drop a course at the 500 or 600 level
June	19	Fri.	Last day of classes
June	22-23	Mon.-Tues.	Final examinations

Second Session

June	29	Mon.	First day of classes
June	30	Tues.	Last day to add a course without permission of instructor
July	3	Fri.	Holiday (Independence Day)
July	6	Mon.	Last day to register (includes payment of tuition and fees) and to add a course; last day to withdraw or drop a course with a refund. *The tuition and fees charge is based on the official number of hours and courses carried at 5:00 p.m. on this day.*

July	10	Fri.	Last day to withdraw or drop a course at the 400 level or below without a grade; last day to change from credit to audit at the 400 level or below; last day to change to credit only
July	17	Fri.	Last day to withdraw or drop a course at the 500 or 600 level
July	31	Fri.	Last day of classes
August	3-4	Mon.-Tues.	Final examinations

FALL SEMESTER, 1992

August	19	Weds.	First day of classes
August	26	Weds.	Last day to add a course without permission of instructor
September	2	Weds.	Last day to register (includes payment of tuition and fees) and to add a course; last day to withdraw or drop a course with a refund; last day for undergraduate students to drop below 12 hours. *The tuition and fees charge is based on the official number of hours and courses carried at 5:00 p.m. on this day.*
September	7	Mon.	Holiday (Labor Day)
September	17	Thurs.	Last day to withdraw or drop a course at the 400 level or below without a grade; last day to change from credit to audit at the 400 level or below; last day to change to credit only
September	30	Weds.	Honors Convocation (no classes until 12:00 noon)
October	2	Fri.	Academic Difficulty Reports due
October	9	Fri.	Fall vacation begins at 1:00 p.m.
October	14	Weds.	Classes resume at 8:05 a.m.
October	19	Mon.	Registration advising for 1993 spring semester begins
October	23	Fri.	Last day to withdraw or drop a course at the 500 or 600 level
October	24	Sat.	TRAC registration opens
November	24	Tues.	Thanksgiving vacation begins at 10:00 p.m.
November	30	Mon.	Classes resume at 8:05 a.m.
December	4	Fri.	Last day of classes
December	7-15	Mon.-Tues.	Final examinations

Note: This calendar is subject to periodic review and revision.

Academic Fields of Study and Degrees

North Carolina State University offers more than 89 fields of study at the undergraduate level. These fields of study include comprehensive academic programs leading to various baccalaureate degrees. Some are options within degree programs, such as the Microbiology Option within the B.S. in Biological Sciences or the Writing-Editing Option within the B.A. in English. The Individualized Study Program in Agriculture and Life Sciences and the Multidisciplinary Studies Program in Humanities and Social Sciences each provide opportunities for creating additional fields of study to meet the specialized needs of particular students.

The following are the undergraduate fields of study available at North Carolina State University:

Agriculture
- Agronomy
- Animal Science
- Food Science
- Horticultural Science
- Poultry Science

Business
- Accounting
- Agricultural Business Management
- Business Management

Biological Sciences
- Biochemistry
- Biological Sciences
- Botany
- Microbiology
- Zoology

Design
- Architecture
- Environmental Design
- Landscape Architecture
- Product Design
- Visual Design

Education (including teacher certification)
- Agricultural Education (grades 9-12)
- Education, General Studies
- English (grades 9-12)
- French Language and Literature (grades 9-12)
- Health Occupations Education (grades 9-12 or postsecondary)
- Marketing Education for Teachers (grades 9-12)
- Mathematics Education (grades 6-9 or 9-12)
- Middle Grades Education (grades 6-9)
- Science Education (grades 6-9 or 9-12)
- Social Studies (grades 9-12)
- Spanish Language and Literature (grades 9-12)
- Technical Education (postsecondary)
- Technology Education (grades 9-12)
- Vocational Industrial Education (grades 9-12)

Engineering
- Aerospace Engineering
- Biological and Agricultural Engineering
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Construction Engineering
- Construction Management
- Electrical Engineering
- Engineering
- Furniture Manufacturing and Management
- Industrial Engineering
- Materials Science and Engineering
- Mechanical Engineering
- Nuclear Engineering
- Textile Engineering

Forestry and Natural Resources
- Conservation
- Fisheries and Wildlife Sciences
- Forestry

Humanities
- Communication
- English
- French Language and Literature
- History
- Philosophy
- Spanish Language and Literature
- Writing-Editing

Individualized Programs
- Individualized Study Program (Agriculture and Life Sciences)
- Multidisciplinary Studies (Humanities and Social Sciences)

Mathematics and Related Sciences
- Applied Mathematics
- Computer Science
- Mathematics
- Statistics

Medical and Veterinary Sciences
- Medical Technology
- Pre-dental
- Pre-medical
- Pre-veterinary

Physical Sciences
- Chemistry
- Geology
- Meteorology
- Physics

Psychology
- Human Resource Development
- Psychology

Recreation, Parks, and Tourism
- Recreation, Parks, and Tourism Management

Social Sciences
- Agricultural Economics
- Applied Sociology
- Criminal Justice
- Economics
- Political Science
- Social Work
- Sociology

Textiles
- Textile Chemistry
- Textile and Apparel Management
- Textile Science
- Textiles

Wood Science
- Pulp and Paper Science and Technology
- Wood Products

PRE-PROFESSIONAL PROGRAMS

Pre-Law Program. Law schools neither prescribe nor recommend a particular undergraduate curriculum for prospective candidates. A student may prepare for law school by a careful use of electives within any of the baccalaureate curricula offered by the eight colleges with undergraduate programs. The College of Humanities and Social Sciences has two faculty advisers designated to assist pre-law students with selection of appropriate electives and concentrations. They also advise the Pre-Law Student's Association, which is open to all interested students. This group invites outside speakers to make presentations about law schools and careers in the law. In addition, the group makes at least one and sometimes two visits per year to local law schools where the students can attend classes and visit with directors of admissions. For further information, consult Prof. D.L. Baumer, 10 Patterson Hall, 737-7156, or Prof. T.V. Reid, 202 Caldwell Hall, 737-2481.

Pre-Medicine, Pre-Dentistry, and Pre-Optometry Programs. Students preparing for medical, dental, or optometry schools major in areas such as the life sciences or physical sciences (frequently biology, chemistry, biochemistry, or zoology), the humanities or social sciences (frequently psychology), or engineer-

ing. Health science professional schools are more interested in the quality and scope of the applicants' education than in their academic major.

The Department of Zoology offers a pre-medical/pre-dental curriculum leading to a baccalaureate degree in zoology. The University Review Committee for Pre-professional Applicants in Health Sciences assists students in preparing applications and in providing evaluations to professional schools. For further information, consult Dr. W. C. Grant, Agriculture and Life Science, chairman of the Review Committee, or the pre-professional health science advisers in the several colleges: Prof. F. M. Richardson, Engineering; Dr. M. L. Miles, Physical and Mathematical Sciences; and Dr. J. W. Wilson, Humanities and Social Sciences.

Pre-Veterinary Program. A pre-veterinary program of study is offered by the College of Agriculture and Life Sciences which may be taken by students majoring in animal science, poultry science, zoology, or biological sciences as well as in many other science curricula, such as biochemistry or chemistry. If a student is accepted to veterinary medical school before completion of his or her undergraduate degree, some course credits may be transferable from the veterinary program toward completion of the Bachelor of Science degree. Arrangements for this procedure should be made with the degree-granting school or department prior to entering veterinary college. For further information, consult the Director of Academic Affairs of the College of Agriculture and Life Sciences. For general information concerning admission to the Doctor of Veterinary Medicine programs at NCSU, consult the College of Veterinary Medicine Admissions Office.

UNDERGRADUATE MINORS

The following undergraduate minors are available to all undergraduate degree students at North Carolina State University:

Accounting, African-American Studies, Agricultural Business Management, Agricultural Economics, Animal Science, Anthropology, Applied Sociology, Arts Studies, Botany, Business Management, Chinese Studies, Classical Greek, Classical Studies, Cognitive Science, Comparative Literature, Computer Programming, Design, Economics, English, Environmental Science, Film Studies, Food Science, Forest Management, French, Genetics, Geology, German, Graphic Communications, History, Horticultural Science, Industrial Engineering, International Studies, Italian Studies, Japanese, Journalism, Linguistics, Materials Science and Engineering, Mathematics, Meteorology, Nutrition, Philosophy, Physical Education (Coaching Emphasis), Physics, Political Science, Psychology, Recreation Resources Administration, Religious Studies, Russian Studies, Science, Technology, and Society, Social Work, Sociology, Soil Science, Spanish, Statistics, Technology Education, Textile Chemistry, Theatre, Women's Studies, Wood Products, and Zoology.

AGRICULTURAL INSTITUTE

Admission to this two-year program requires high school graduation and a letter of recommendation. The program does not carry college credit. An Associate of Applied Science degree is awarded. Fields of study are:

Agribusiness Management
Agricultural Mechanization and Management
Agricultural Pest Control
Field Crops Technology
Food Processing, Distribution, and Service
General Agriculture
Livestock Management and Technology (Animal Husbandry and Dairy Husbandry Options)
Ornamentals and Landscape Technology
Turfgrass Management

UNDERGRADUATE DEGREES AND DEGREE OPTIONS

Bachelor of:

School of Design

architecture (fifth-year program); environmental design; environmental design in architecture; environmental design in landscape architecture; environmental design in product design; and environmental design in visual design.

College of Humanities and Social Sciences

social work.

Bachelor of Science in:

College of Agriculture and Life Sciences

(Business) agricultural business management

(Science) agricultural economics; agricultural systems technology; animal science; applied sociology (including option in criminal justice); biochemistry; biological sciences (including an option in microbiology); botany; conservation; fisheries and wildlife sciences; food science; horticultural science; medical technology; poultry science; pre-veterinary option; and zoology (including options in pre-dental and pre-medical).

(Technology) agronomy; animal science; biological and agricultural engineering; food science; horticultural science; and poultry science.

(Individualized Study Program) in agriculture and life sciences.

College of Education and Psychology

agricultural education; education, general studies; health occupations teacher education; marketing education for teachers; mathematics education; middle grades education; science education; technical education; technology education; and vocational industrial education.

College of Engineering

aerospace engineering; biological and agricultural engineering; chemical engineering; civil engineering; civil engineering, construction option; computer engineering; computer science; construction management; electrical engineering; engineering; furniture manufacturing and management; industrial engineering; materials science and engineering; mechanical engineering; and nuclear engineering.

College of Forest Resources

conservation; forestry; parks, recreation, and tourism management; pulp and paper science and technology; wood products.

College of Humanities and Social Sciences

economics; English; history; philosophy; and political science.

College of Physical and Mathematical Sciences

chemistry; geology; mathematics; meteorology; physics; and statistics.

College of Textiles

textile chemistry; textile engineering; textile and apparel management; textile science; and textiles.

Bachelor of Arts in:

College of Education and Psychology

psychology (including option in human resource development).

College of Humanities and Social Sciences

accounting; business management; communication; economics; English (including options in teacher education and writing-editing); French (including an option in teacher education); history; multidisciplinary studies in humanities and social sciences; philosophy; political science (including an option in criminal justice); social studies education option (in history, political science, or sociology); sociology (including an option in criminal justice); and Spanish (including an option in teacher education).

College of Physical and Mathematical Sciences

chemistry; geology.

PROFESSIONAL DEGREES

College of Engineering

Chemical Engineer; Civil Engineer; Electrical Engineer; Industrial Engineer; Materials Engineer; Mechanical Engineer; and Nuclear Engineer.

College of Veterinary Medicine

Doctor of Veterinary Medicine

GRADUATE DEGREES

Master of:

agriculture; architecture; biological and agricultural engineering; biomathematics; chemical engineering; chemistry; civil engineering; computer engineering; computer science; economics; education; electrical engineering; engineering (off-campus program only); forestry; industrial engineering; integrated manufacturing systems engineering; landscape architecture; life sciences; materials science and engineering; mechanical engineering; nuclear engineering; product design; public affairs; recreation resources administration; sociology; statistics; technology for international development; textiles; toxicology; wildlife biology; and wood and paper science.

Master of Arts in:

archival management; economics; English; history; liberal studies; and political science.

Master of Science in:

adult and community college education; aerospace engineering; agricultural economics; agricultural education; animal science; applied mathematics; biochemistry; biological and agricultural engineering; biomathematics; botany; chemical engineering; chemistry; civil engineering; computer engineering; computer science; crop science; curriculum and instruction; ecology; educational administration and supervision; electrical engineering; entomology; food science; forestry; genetics; guidance and personnel services; horticultural science; industrial arts education; industrial engineering; management; marine, earth and atmospheric sciences; materials science and engineering; mathematics; mathematics education; mechanical engineering; microbiology; middle grades education; nuclear engineering; nutrition; occupational education; operations research; physics; physiology;

plant pathology; poultry science; psychology; recreation resources administration; rural sociology; science education; soil science; special education; statistics; technical communication; textile chemistry; textiles; toxicology; veterinary medical sciences; vocational industrial education; wildlife biology; wood and paper science; and zoology.

Doctor of Philosophy in:

aerospace engineering; animal science; applied mathematics; biochemistry; biological and agricultural engineering; biomathematics; botany; chemical engineering; chemistry; civil engineering; crop science; computer engineering; computer science; economics; electrical engineering; entomology; fiber and polymer science; food science; forestry; genetics; horticultural science; industrial engineering; marine, earth and atmospheric sciences; materials science and engineering; mathematics; mathematics education; mechanical engineering; microbiology; nuclear engineering; nutrition; operations research; physics; physiology; plant pathology; psychology; science education; sociology; soil science; statistics; toxicology; veterinary medical sciences; wood and paper science; and zoology.

Doctor of Education in:

adult and community college education; curriculum and instruction; educational administration and supervision; guidance and personnel services; industrial arts education; and occupational education.

Consult the Graduate Catalog for further information on graduate programs and admissions procedures.

Natural Resources Curricula

The area of "natural resources" covers broad, technically complex and interrelated systems of physical, biological, economic, and political areas. Rising demand for use of all natural resources, from recreational opportunities to minerals, from mountain forests to the ocean depths, creates difficult environmental, economic, and ethical questions. Recognizing that no one curriculum can cover all aspects of natural resources, curricula have been designed to provide a broad based education dealing with specific aspects of natural resources.

At the present time, the following curricula address issues related to natural resources:

College of Agriculture and Life Sciences
- Agricultural and Resource Economics
- Agronomy
  - Soil Science Concentration
- Botany
- Biological and Agricultural Engineering
- Biological Sciences
- Conservation
  - Environmental Technology Concentration
  - Natural Resource Management and Administration Concentration
  - Soil Conservation Concentration
- Fisheries and Wildlife
- Horticulture (Landscape Horticulture)
- Zoology

School of Design
- Environmental Design in Landscape Architecture

College of Engineering
- Civil Engineering

College of Forest Resources
- Conservation
  - Administration and Management Concentration
  - Natural Resources Concentration
  - Soil Concentration
- Forestry
  - Management Concentration

College of Physical and Mathematical Sciences
- Chemistry
- Geology
- Meteorology

Arts Studies

North Carolina State University offers a rich variety of courses in the history, analysis and production of the arts—dance, film, music, theatre, visual arts. Many of these courses are open to students without prerequisite. Because they are offered by thirteen departments in four different colleges of the university, they are listed together below. They are described in detail in the "Course Description" section of the catalog under the indicated course prefix.

In addition to these courses, most of which focus on a single art form, the Division of Multidisciplinary Studies offers special topics courses (MDS 295, 495) each of which deals with several arts media or with the arts in connection with science and technology; information about these courses, which change each year, is available from the Office of Multidisciplinary Studies in Harrelson Hall.

For students who want to concentrate in Arts Studies, an academic minor is available. In addition, there are minors in Theatre, Design, and Film Studies.

Students may also major in Multidisciplinary Studies with a concentration on Arts Studies. This program makes it possible for students to prepare themselves, for example, for graduate programs in art conservation or medical illustration.

Opportunities for students to participate in arts activities include many instrumental and choral organizations, student productions in Thompson Theatre, craft instruction and facilities in the Craft Center, and the exhibitions of the Visual Arts Program. These activities, many of which are integrated with academic courses, are described in more detail under "Student Activities" later in this section of the catalog.

NOTE: *Courses that involve substantial "hands on" activities are indicated by italics.*

Aesthetics:	DN 445, ENG 496, PHI 306
Art and Design	ARC 441; DF *111*, *112*; DN 141, 142, *212*, 221, 222, 231, *311*, *312*, *354*, *411*, *414*, *454*; LAR *234*, 443, 444; TED *230*, *246*, *351*; VD 242
Dance:	PE *263*, *264*, *272*, *273*, *274*, *275*
Film:	COM *244*, 364, 374; DN *316*; ENG 282, 482
History of Art:	HA 201, 202, 203, 305, 401, 402, 404
Music:	MUS *100*, *101*, *102*, *110*, *120*, 150, 200, 210, 215, 220, 230, 240, 250, 300, *301*, *302*, *305*, 320, 350
Several Arts:	CL 495; ECI 415; FLF 315, 352; FLS 315, 316; MDS 327; RRA 365
Theatre:	COM *103*, *203*, 213, *223*, 233, *303*, *323*
Writing:	ENG *288*, *289*, *488*, *489*, *588*, *589*

Honors and Scholars Programs

UNIVERSITY SCHOLARS PROGRAM

The University Scholars Programs are designed to address the needs of students who are academically successful, highly motivated, and committed to excellence and intellectual exploration. Coordinated between the Division of Student Affairs, the University Undesignated Program, the School of Design and the Colleges of Agriculture and Life Sciences, Education and Psychology, Engineering, Forest Resources, Humanities and Social Sciences, Physical and Mathematical Sciences, and Textiles, the University Scholars Programs provide a variety of unique educational experiences for qualified undergraduates. Students are invited to participate on the basis of selection criteria specific to each school or college.

Participants in the University Scholars Programs have the opportunity to enroll in sections of academic courses reserved for Scholars. These courses, which are taught by distinguished faculty members, encourage the development of a learning environment that is richly invigorating and intellectually stimulating.

Scholars also attend a weekly Forum Series which includes guest speaker presentations and discussions on issues of contemporary social and educational significance. Through the University Scholars Programs, NCSU Scholars are members and participate in the activities of the North Carolina Honors Association, the Southern Regional Honors Council and the National Collegiate Honors Council. Extracurricular opportunities and educational field trips are also made available to broaden the personal and cultural horizons of participants. In addition to these activities, there are specific academic expectations defined by the respective schools or colleges.

For more information contact the Coordinator of University Scholars Programs (102 Sullivan, 737-2353) or the office of the appropriate college dean.

HONORS PROGRAMS

Honors programs are offered by the academic colleges. Students who complete an honors program are designated with a prefix "H" on the commencement program and their permanent records indicate honors classes. Honors participants benefit from a more individualized and rigorous approach to their desired degree through special classes, seminars, and individual research.

The Colleges of Agriculture and Life Sciences, Humanities and Social Sciences, Forest Resources, Physical and Mathematical Sciences, and Textiles have college-wide honors programs. Information is available from the office of the dean of each of these colleges. The Psychology Department has an honors program.

Students who have achieved an average of 3.0 (B) or better in their first semester, first year, or first two years *may* be eligible for honors programs, but some programs require higher averages. Students who feel they are eligible should take the initiative to learn about honors program opportunities by contacting the Associate Dean for Academic Affairs of their college.

Scholarships

UNIVERSITY MERIT AWARDS PROGRAM FOR ENTERING FRESHMEN

N. C. State University offers a competitive scholarship program for entering freshmen to recognize and to encourage exceptional academic ability and achievement. Graduating seniors of good character and leadership potential who have excelled in their high school academic and extracurricular endeavors may apply for a large number of merit award opportunities at the university. Financial need is not a consideration in the selection of recipients for these awards.

Each year the Merit Awards Program conducts a nation-wide competition for approximately 80 university-wide scholarships (available to students entering any academic major) as well as over 125 other scholarships that are offered through individual colleges and departments. Completion of the Merit Awards Program application packet, which consists of the student's application as well as

other supporting documents, assures that a student will be considered for all available freshman merit awards. The application packet is available by August preceding the student's senior year in high school, and the application deadline is mid-November of the senior year.

Semifinalists are identified from the entire applicant pool in mid-January and are invited to North Carolina State University in February for personal interviews. An interview for finalists is conducted in March, after which award recipients are announced in early April.

The **John T. Caldwell Alumni Scholarship**, which is sponsored by the NCSU Alumni Association, is the university's most prestigious award for entering freshmen. At least 30 Caldwell Scholarships valued at $3500/year (up to $14,000 for four years) for in-state recipients and $6000/year (up to $24,000 for four years) for out-of-state recipients are offered each year. This excellent scholarship seeks students who demonstrate both academic excellence and strong leadership potential.

Yearly renewal of the Caldwell and the other university-wide renewable awards assumes the maintenance of a 3.0 grade point average once a recipient is engaged in full-time coursework at the University.

Many other scholarships ranging from $1000 for the freshman year up to the Caldwells are available in each year's competition.

Students who rank near the top of their class and who have strong SAT scores (in the range of 1200 or above) should request their Merit Awards application packet from:

Merit Awards Program
North Carolina State University
2118 Pullen Hall, Box 7342
Raleigh, North Carolina 27695-7342

Phone inquiries are welcome: (919) 737-3671.

UNIVERSITY FACULTY SCHOLARSHIPS FOR JUNIORS AND SENIORS

Rising juniors and seniors who have outstanding records of scholarly achievement, whose college careers have been spent at NCSU (exclusive of summer school and exchange programs), and who have not been awarded a concurrent academic scholarship of over $2,000 a year are eligible to apply for one-year, renewable University Faculty Scholarships. Up to four University Faculty Scholarships, each for $4,000 are awarded annually. The Executive Council of the Academy of Outstanding Teachers will constitute the selection committee. Applications for University Faculty Scholarships to be awarded for the 1991-92 academic year must be submitted to Dr. Gerald G. Hawkins, Associate Vice Chancellor, Student Affairs, Box 7316, NCSU Campus (737-3151).

COLLEGE AND DEPARTMENTAL SCHOLARSHIPS FOR CONTINUING STUDENTS

A number of scholarships based upon academic achievement are administered directly through some of the academic departments for students engaged in

full-time coursework at the university. See the Colleges, Departments, and Programs of Study section later in the catalog. A continuing student should contact the college department of his or her academic major for information about specific scholarship opportunities that do not require the filing of financial information.

Special Academic Programs

UNIVERSITY UNDESIGNATED PROGRAM

The University Undesignated Program, 528 Poe Hall (737-3593), helps selected freshmen explore the University's diverse programs of study for up to 36 credit hours before declaring their academic majors. The staff is responsible for academic advising and other activities designed to help enrolled students make rational and informed decisions in the selection of the major fields. Currently, approximately 200 new freshmen with a minimum expected first-year performance of about 2.40 are admitted each year. University Undesignated freshmen are required to enroll in a year-long orientation course specifically designed to provide a formal vehicle for the exploration of the many fields of study at the University as well as in a specially selected enrichment course.

UNIVERSITY TRANSITION PROGRAM

The University Transition Program, 102/104 Reynolds Coliseum (737-7053), serves to help selected new freshmen get a good start at NCSU. Approximately 65 freshmen are admitted to the University through this program. Participants in the program are required to attend the second Summer Session, taking carefully selected courses as a part of their freshman year. Additionally, as part of their first-year experience, University Transition students are enrolled in a one-hour course focusing on personal development, study skills, and other areas crucial to college success. Individual advising on course selection, personal counseling, and tutorial assistance are provided throughout the year.

University Transition students may begin to select their major field of study during the second semester of their freshman year. Participants must transfer into a degree program no later than their fifth semester at NCSU.

COOPERATIVE EDUCATION PROGRAM

The Cooperative Education Program is designed to be an integral part of a student's educational program and is offered in all colleges. The co-op program enriches and expands classroom learning by providing sponsored work assignments in industry, business and government. Work experience is selected based on its relevance to a student's major and/or career goals and provides for alternating semesters of study and full-time work. This alternating plan is available in all colleges. A parallel plan (part-time study and part-time work) is also available as an option in several colleges.

The co-op experience normally takes place during the sophomore and junior years and means that attaining a degree will take more than eight semesters. A grade point average of 2.25 is required for students entering this program. Freshmen are not eligible, and transfers must first complete at least one semester at NCSU. Engineering students must have been admitted to a degree program. To remain in the program, students must maintain a cumulative average of 2.00, agree to participate for a minimum of 12 months of full-time work experience or its equivalent, and be registered for each work period.

EVENING UNDERGRADUATE DEGREE PROGRAMS

The College of Humanities and Social Sciences offers complete undergraduate degree programs during the evening hours for adult part-time students. Such degree programs are available in the division of Economics and Business; the departments of Communication; English; History; Sociology, Anthropology, and Social Work; Foreign Languages and Literatures; and Political Science; as well as in Multidisciplinary Studies. Persons interested in more information about these evening degree programs should contact the Coordinator of Evening Programs, College of Humanities and Social Sciences, Box 8101, N.C.S.U., Raleigh, N. C. 27695-8101; (919) 737-3638.

NON-DEGREE CERTIFICATE PROGRAMS

Non-degree certificate programs are prescribed sets of regular academic courses which offer limited but structured continuing education opportunities. They are designed expressly for Lifelong Education Students, and students enrolled in undergraduate or graduate degree programs at NCSU are not eligible to participate simultaneously in these certificate programs. Satisfactory completion of the prescribed courses is recognized by the issuing of a certificate from the department or college that offers that program.

Certificate programs are currently offered by the following academic units: Department of Adult and Community College Education—**Studies in Gerontology**; Department of Communication—**Human Communication**, with track options in Public Communication, Interpersonal Communication, Organizational Communication and Theater Communication; Department of Computer Science—**Computer Programming** (PBS students only); Department of English—**Professional Writing**; Department of Occupational Education—**Trainer Development**; Department of Political Science and Public Administration—**Management Development** (PBS students only) with program areas such as Adult and Community College Administration, Data Management, Financial Management, Human Resources Management, Management Control Systems, and Public Affairs; and the College of Textiles—**Textiles** with subject areas including Apparel Production, Dyeing and Finishing, Fabric Production, Textile Fibers and Polymers, Fiber Science for Textile Conservators, Textile Administration, Textile Fundamentals, and Yarn Manufacturing.

For information concerning enrollment requirements and prescribed courses for a particular certificate program, consult the department or college offering that program or the Division for Lifelong Education (737-2265).

THE FIRST YEAR EXPERIENCE

The First Year Experience is designed to help freshmen make a successful transition to the college environment. Freshmen in the program live together in designated residence halls.

First Year Experience students take a one-credit hour seminar each semester where academic and transitional issues are discussed. The seminar is taught by excellent faculty and professional staff who have special interest in the education of first year students.

Students who participate in the program can enroll in certain classes combined in thematic clusters. Registration in these cluster classes is reserved for freshmen in the program, and some of the courses are taught in Residence Hall classrooms.

Each student in the program also has an upperclass student mentor and an adult mentor (a faculty or staff member) available to assist them in making a successful transition to NCSU.

Participation in The First Year Experience is selective and based on potential contributions to the program. Students are expected to be active participants in The First Year Experience. Students interested in applying or wishing additional information should contact the Assistant Dean for Undergraduate Studies or call 737-7528.

UNDERGRADUATE STUDIES TUTORIAL CENTER

The Undergraduate Studies Tutorial Center, 528A Poe Hall (737-3163) is open to any student at NCSU taking 100- or 200-level courses in English, foreign languages, math, and science. It provides one-to-one and small group tutorial in many entry-level courses. Tutoring sessions focus on study skills and learning techniques as well as course content. Tutors are carefully selected for their ability to communicate and their expertise in their subject areas. Students agree to meet with tutors on a regular basis once or twice a week and are encouraged to begin their participation in tutorials early in the semester and continue throughout the semester to assure their chances for academic success at NCSU. The program encourages communication between instructors and tutors.

Supplemental Instruction

The Undergraduate Studies Tutorial Center also offers Supplemental Instruction (SI) for selected sections of chemistry, mathematics, and physics. Students in SI sections of these courses can meet with an SI leader for three hours of review each week.

THE PEER MENTOR PROGRAM

The Peer Mentor Program is a student peer-helper program through which academically talented upperclass African-American students serve as "mentors" to entering African-American students. This program stresses the mentoring process as a prime motivating in the recruitment, retention, and graduation of minority students from this university. It assists the freshmen in making a

successful transition to campus life by providing them with a supportive contact person who acts as a sounding board for personal adjustment problems; interprets university policies; makes proper referrals; and generally, provides them with strategies for academic, emotional, and social success at NCSU.

All incoming African-American freshmen are assigned a peer mentor prior to their arrival on campus. These freshmen are paired with upperclass students who are in the same major whenever possible. Because the peer mentors are trained in "helping skills" and possess a working knowledge of the campus environment, they play a significant role in influencing students' perceptions of themselves and of the potential benefits and rewards which can be gained from the post-secondary learning experience.

COOPERATING RALEIGH COLLEGES

The Cooperating Raleigh Colleges (CRC) is a voluntary organization comprised of North Carolina State University, Meredith College, Peace College, St. Augustine's College, St. Mary's College, and Shaw University for the purpose of developing and conducting cooperative educational activities. The organization provides the opportunity for students to enroll at another institution for a course or courses not offered on their home campus. Other activities include a cooperative library arrangement, joint student activities, and faculty cooperation and interchange.

Any NCSU *undergraduate degree* student who is enrolled in at least eight credit hours on the NCSU campus may take a course at another Raleigh college during a fall or spring semester (except that men may not enroll in courses at Peace College) provided that (a) the course is not taught on the NCSU campus and (b) the adviser and dean consider the course educationally desirable.

Students may not register for more than a total of two courses in any semester at other CRC colleges. Under extenuating circumstances, exceptions for an additional course registration may be approved by the requesting student's school dean.

Home campus students have first priority in class assignment. Courses taken at other institutions may be used as free electives and as alternatives to restricted electives, if so approved by adviser and dean. Credits earned in this manner may apply toward fulfilling graduation requirements, but grades from other CRC institutions are not used in computing a student's NCSU grade point average. Under this agreement, regular tuition and fees are paid to NCSU. Certain special fees may be required for special courses at other colleges, and the student is responsible for paying such fees. During the summer, there is no interinstitutional program with local colleges. A student desiring to take a summer course must register directly with the institution offering the course.

NOTE: *Lifelong Education students may not register for courses through interinstitutional procedure.*

NATIONAL STUDENT EXCHANGE PROGRAM

North Carolina State is one of 70 colleges and universities in the United States belonging to the National Student Exchange Program. Each year an opportunity

is provided for NCSU students to study at one of the other participating schools and still pay the same tuition and fees they pay here, thus avoiding the red tape normally associated with a change of school. Students returning from exchange reflect an increased feeling of independence, self-reliance and self-confidence, and a better appreciation of home region, family and home campus. A major impact of the exchange year has been an increased awareness and appreciation for the vast differences in ideas and values found in different geographic locations. Eligible students must be an undergraduate with a 2.5 grade point average or better and be selected by a screening committee. Preference is given to North Carolina residents. For further information contact the National Student Exchange Office in 2120 Pullen Hall.

NORTH CAROLINA STATE FELLOWS PROGRAM

North Carolina State University offers a special learning and self-development experience known as the North Carolina State Fellows Program. The program is designed to assist outstanding, talented students to develop their leadership potential at an accelerated pace, and to accomplish this in ways not usually afforded by the university. Each year approximately 30 new freshmen are selected to participate in the program as Fellows. The program seeks to identify students of exceptional ability and motivation and to encourage their development as potential leaders for business, governmental, educational and other professional communities. The program attempts to fulfill its goal by providing training and developmental opportunities.

International Programs and Activities

INTERNATIONAL STUDENTS

About 1,100 students from approximately 90 countries attend the university and enrich the campus and community. The International Student Office assists these students with immigration and passport matters, currency permits, and medical, personal, and social concerns.

International applicants are carefully screened for evidence of English language proficiency, adequate finances, and academic credentials indicating excellent potential for success. *The minimum TOEFL requirement for admission consideration to North Carolina State University is 550 with scores of at least 50 on two sections and no score lower than 45.* The Lifelong Education Student category is not available to persons on temporary visas. The university has authority to issue Forms I-20 for F-1 visas and Forms IAP-66 for J-I visas to fully qualified individuals.

An orientation program for new international students students is conducted during the week preceeding the fall and spring semesters.

International students are required to purchase the university student insurance policy or provide proof of agency sponsor coverage. Special courses in English for Foreign Students (FLE) are required for those whose scores on the Test of English as a Foreign Language (TOEFL) are sufficiently high for admission but who need further instruction to perform well academically.

The International Student Committee of the University Student Center sponsors a variety of social and cultural programs for international and American students.

SUMMER INSTITUTE IN ENGLISH FOR SPEAKERS OF OTHER LANGUAGES

The Summer Institute in English for Speakers of Other Languages is a five-week, intensive English language program for students from other countries who intend to pursue university studies or specialized training programs in the United States in the fall. The institute, which is jointly sponsored by the Department of Foreign Languages and Literatures and the Division for Lifelong Education, is held from early July to early August each summer. It is designed to provide students with intensive instruction and practice in the use of the English language. Emphasis is on developing fluency in speaking and understanding oral English as well as reading and writing skills.

The institute also offers orientation to American life and institutions to give students insight into life in the U.S. and to help them to adjust to the new environment. There are films, lectures by guest speakers, and field trips on weekends to places of historic, cultural and scenic interest.

Prospective students should have studied English and acquired some facility in the use of the spoken language prior to enrolling in the institute since its curriculum is not designed for beginners.

Admission to the institute does not imply admission as a degree candidate at North Carolina State University or any other campus of the University of North Carolina System.

The TOEFL Test (Test of English as a Foreign Language) is administered to students who wish to take it on the last day of the program. Since this is an institutional administration of the test, scores may not be sent to other institutions but are accepted by the Admissions Office and Graduate School at NCSU.

ALEXANDER INTERNATIONAL PROGRAM

The Alexander International program is a residence hall community for both American and international students. The 174 resident members of the program share the common goal of developing their understanding of different cultures and countries and developing cross-cultural relationships. The 87 American students and the equal number of international students, representing approximately 40 foreign countries, become more sensitive to the values of different peoples, systems of government, economic structures, and religions. These goals are achieved through informal interactions, social and educational programming, and American and international roommate pairing.

Program activities in past years have included both an international dinner and international coffeehouse series, emphasizing customs, foods, and entertainment from various cultures. Workshops on cultural differences, cross-cultural communication and relationships, international employment opportunities, and overseas studies are regularly included in the annual calendar of programs and activities. These activities provide an opportunity for American students to add an international dimension to their education while attending NCSU.

Participation in this international program is selective and based upon potential contributions to the program. Students are expected to be active participants, to initiate programming, and to be supportive of the program goals. Students interested in applying or additional information should inquire at 105 Alexander International Hall (737-2925).

STUDY, TRAVEL, AND SHORT-TERM EMPLOYMENT ABROAD

The Study Abroad Office assists students interested in overseas study and travel, short-term employment in foreign countries, and national and international scholarship competitions for study abroad. The staff provides personal and group advising, sponsors program presentations and information sessions, conducts orientation programs, and maintains a resource library.

Many students participate in study abroad programs sponsored by NCSU, other U.S. colleges and universities, U.S. educational institutions, and foreign universities. The Study Abroad Office maintains descriptive literature and directories for over 1,000 individual programs. The staff advisors will assist students in selecting and evaluating various programs, assist in the procedure for approval of academic credit transfer, and suggest basic orientation readings and activities. The resource library materials include information on grant sources and competitions. These include annual competitions such as Fulbright Grants for graduate study, Marshall Scholarships for graduate study in the United Kingdom, Rhodes Scholarships for Oxford University, England, and many programs which award specific country or specific academic curriculum grants for foreign study.

Short-term employment and internship positions in a foreign country are also available. A program sponsored by the Council on International Educational Exchange assists students interested in summer or short-term (3-6 months) employment in Great Britain, France, Ireland, West Germany, New Zealand, Jamaica, and Costa Rica. InterExchange coordinates similar programs in Australia, Austria, Finland, France, Norway, Switzerland, West Germany and Yugoslavia. Both of these programs provide for employment visas and assistance in obtaining short-term employment.

For students interested in summer and vacation period travel, the Study Abroad Office can provide assistance in planning a trip. Information is available concerning passport and visa applications, low cost accommodations, group travel programs, Eurail and other public transportation discount programs, International Student Identity Cards, overseas travel arrangements, and background information on specific countries.

Students interested in discussing study, travel, and short-term employment in other countries should contact the Study Abroad Office located at 2118 Student Services Center (737-2087).

International Student Exchange Program. North Carolina State University is one of 100 colleges and universities in the United States participating in the International Student Exchange Program. Through ISEP, undergraduate students may attend any of 100 member institutions in Africa, Asia, Australia, Canada, Europe, and Latin America on an exchange student basis for a summer semester or single academic year.

North Carolina State students pay a program fee for their stay abroad which is based on their regular tuition and fees plus the cost of room and board at North Carolina State. Aside from travel expenses and health coverage, ISEP makes it possible for NCSU students to study outside the country for the same cost of continuing studies at NCSU. This arrangement also allows students to maintain their eligibility for financial aid. While abroad, ISEP students are entitled to all the benefits and services of regular full-time students at their host institutions. Room and board are provided and an ISEP coordinator on each campus is available to students for assistance with any problem.

To apply to participate in ISEP at NCSU a student should have a cumulative grade point average of at least 2.5 and have already studied at NCSU for two semesters. Applicants must be proficient in the language of instruction at the study sites they choose. A campus selection committee, made up of faculty members, chooses those applicants as North Carolina State's participants. Applicants are not in competition with each other. The ISEP Selection Committee bases its decision on the feasibility of each applicant's proposed course of study, on academic background, application and references. The selection process for each academic year takes place in the winter of the preceding year. Students begin the application process by requesting a copy of the ISEP Directory from the Study Abroad Office.

Semester in Santander, Spain. The University of North Carolina at Charlotte and North Carolina State University, in cooperation with the University of Cantabria, offer a Fall Semester Abroad program in Spain. Undergraduates from both North Carolina institutions, as well as qualified students from other institutions, spend a semester in the coastal city of Santander, taking classes in Spanish language, literature, art, geography and history. Students entering the program are expected to have completed four semesters of college Spanish or the equivalent with a grade of C or better. Overall academic average should be at least 2.5. Students may enroll for 12 to 15 credit hours. A member of the NCSU faculty of Foreign Languages and Literatures serves as resident director of the program. Further information may be obtained from the Study Abroad Office.

Summer Study at Oxford, England. This program offers North Carolina State University students a four-week summer experience at Oxford, England. The program is limited to 30 participants and students may take one or two courses. Academic transfer credit is granted for this work by NCSU. Courses usually include Shakespeare, British History, and History of Art. All courses are taught by British scholars. Ample time is made available for independent travel in order to maximize the British experience. Contact the Study Abroad Office.

Summer Study in London, England. The College of Humanities and Social Sciences and the Division of Student Affairs offer a four-week summer study program in London. Students live at Canterbury Hall, University of London, and take one or two credit courses in British literature or the arts offered by NCSU faculty. The courses are illustrated by group visits to various literary and historical sites in the London area as well as all-day tours outside of London. Evening sessions include plays, concerts, and lectures by British authorities. Weekends are free for independent travel. For specific details contact the Study Abroad Office.

Summer Study in Germany. In cooperation with the University of North Carolina at Charlotte, NCSU offers a month-long program which includes intensive instruction in the German language (intermediate level) and lectures on German culture and civilization. Instruction is by the Program Director (from UNC-C) and German instructors. The program is open to students with two prior semesters of university level German or equivalent. Contact the Study Abroad Office for further information.

Summer Study in Mexico. The Department of Foreign Languages and Literatures sponsors a five-week Summer Study Program in Mexico, through which students can gain up to six academic credits. The program for both beginning and advanced students is designed to foster oral command of the language and to provide enrichment through first-hand knowledge of Mexican civilization and culture. In Mexico students visit places of interest, attend daily classes and have the opportunity to live with a Mexican family. A member of the NCSU faculty of Foreign Languages and Literatures serves as resident director and advisor, coordinating both academic work and extracurricular activities. Further information may be obtained from the Study Abroad Office.

Summer Study in Togo, West Africa. Started in 1989, this program is the first NCSU program in the continent of Africa. Students have the opportunity to study in Lomé, the capital of Togo, and learn about West African culture. Courses offered are Elementary, Intermediate French and African-American studies. Additional day trips are planned. For details, contact the Study Abroad Office.

In addition to the study abroad programs described above, NCSU sponsors year-long exchanges in England, France, Japan, Netherlands, Costa Rica, Australia and Scotland. Details on these programs are available from the Study Abroad Office.

Admissions

The freshman application deadline for the fall semester and summer sessions is February 1; the transfer student deadline is April 1. Freshmen are encouraged to apply during the fall of the senior year in high school, as students will be accepted until the classes have been filled. Applicants for the School of Design should submit applications by January 1. Applications for the spring semester should be submitted prior to November 1.

Each applicant must complete an application form which may be obtained from high school counselors or by writing to:

Director of Admissions
Box 7103
North Carolina State University
Raleigh, North Carolina 27695-7103

A nonrefundable $35 fee must accompany the completed application.

FRESHMAN ADMISSION

Admission to the university is competitive and, as those programs in high demand are more competitive, it is possible to be admissible to some programs but not to all programs at N.C. State. Applicants are asked to indicate their first, second and third choices for a curriculum, including undeclared majors within a college, or to indicate their choice of participating in the University Undesignated Freshman Program. Applications which are not admissible in the first curriculum choice will be reviewed for admissibility in the alternate curriculum choices.

The admissions decision is based on the completion of the minimum entrance requirements set forth below and on the evaluation of the high school record, including the level and difficulty of the courses taken, the overall grade point average, rank in class and scores on the Scholastic Aptitude Test. These factors are reviewed with the curriculum choice to determine the likelihood of success as a freshman at N.C. State.

The Board of Governors of The University of North Carolina System has determined that the minimum undergraduate admissions requirements for all constituent institutions, including North Carolina State University, shall be:

—A high school diploma or its equivalent
—English - four (4) course units in English, emphasizing grammar, composition, and literature
—Mathematics—three (3) course units in mathematics, including algebra I, algebra II, and geometry, or a higher level mathematics course for which algebra II is a prerequisite
—Social Studies - two (2) course units in social studies, including one (1) unit in U.S. history
—Science - three (3) course units in science, including at least one (1) unit in a life or biological science; at least one (1) unit in a physical science (for example, physical science, chemistry, physics), and at least one (1) laboratory course.
—In addition, it is recommended that prospective students complete at least two (2) course units in one foreign language, and take one (1) foreign language course unit and one (1) mathematics course unit in the twelfth grade.

Any additional entrance requirements for admission to North Carolina State University will be set forth in the Freshman Admissions Bulletin for that year.

Applicants are accepted on either junior or senior test scores, although senior scores are recommended, especially if the applicant is also applying for financial

aid. An interview is not required and does not weigh in the admissions decision; a prospective student is always welcome to visit the Admissions Office, 112 Peele Hall. The Admissions Office conducts group information sessions every Monday, Wednesday and Friday at 10:30 a.m. and on Tuesday and Thursday at 1:30 p.m. Campus tours led by students are conducted each weekday, weather permitting, at 12:00 noon, starting at the Memorial Bell Tower.

Two-Year Agricultural Institute

Requirements for admission to the Agricultural Institute, a two-year terminal program, include graduation from an accredited high school or successful completion of the high school equivalency examination administered by the State Department of Public Instruction. The application should include either a copy of the high school record or a letter indicating the applicant has passed the equivalency examination and a letter of recommendation. Each application is reviewed and evaluated by the Institute Director. SAT scores are not required but are recommended. Course work is not transferable into the four-year degree programs.

Scholastic Aptitude Test

Applicants for admission as freshmen must take the College Board Scholastic Aptitude Test (SAT) and request that their scores be sent directly from the Board to North Carolina State University (Code No.—R5496). Information booklets and application forms may be obtained from school counselors or by writing:

The College Board ATP
Box 592
Princeton, New Jersey 08541

Achievement Tests

Freshman students should take the Mathematics Achievement Test administered by Educational Testing Service to ensure proper math placement at NCSU. Students in curricula for which the normal *first* mathematics course is calculus should take the Level II test. Students in all other curricula should take the Level I test. Current admissions information and the application contain information about appropriate achievement tests for each curriculum.

Students who have not taken the Mathematics Achievement Test will be placed in a pre-calculus course.

The English Achievement Test is not required but students who have taken it will receive more accurate placement in beginning English classes.

Advanced Placement

A student may qualify for advanced placement by one or more of the following means: 1) by passing a proficiency examination administered by a teaching department at NCSU; 2) by attaining a sufficient predicted grade in English (PGE) which is based on the SAT Verbal score or English Achievement test and the high school record, including grade point average and class rank; 3) by

attaining a sufficient score on the Mathematics Achievement Test which is administered during Freshman Orientation if the student has not already submitted scores; 4) by meeting a specific minimum score on certain of the CEEB Advanced Placement Program (APP) examinations; and 5) by attaining at least a minimum score (generally 3) on certain of the College Level Examination Program (CLEP) subject tests.

OUT-OF-STATE STUDENTS

Undergraduate applicants from outside North Carolina may be required to meet more competitive standards for admission than N. C. residents. North Carolina State University is limited to accepting not more than 18 percent of total new undergraduate students from outside the State.

TRANSFER STUDENTS

North Carolina State University welcomes transfer applicants, and in recent years, more than 25 percent of our graduates started their college programs at other institutions.

A transfer student should present at least 28 semester hours (or 42 quarter hours) of satisfactory (C or better) college-level work with a minimum overall 2.0 (C) average on all college work attempted and be eligible to return to the last institution regularly attended. *Many programs require a higher minimum grade point average for admission.* Individual official transcripts must be submitted from each institution attended. The college credits must have been earned at a regionally accredited institution and should include a college-level math or the high school record must be submitted to show proper background. Applications of students from non-regionally accredited institutions will be reviewed by the Admissions Committee.

Students who graduated from high school in June of 1988 or later must submit a high school record to verify that they have met minimum admissions requirements as outlined in the Freshman Admissions section of this catalog. Exceptions to this requirement are students who will have earned an A.A., A.S. or A.F.A. degree before enrolling at NCSU. Individuals who do not have the minimum admissions requirements at the high school level must complete at the college level 6 semesters or 9 quarter hours each of English, mathematics, science and social science to be eligible to transfer.

Applications from technical institutes, technical colleges, and technical programs at community colleges are evaluated on an individual basis. Credits from such programs are generally not considered for automatic transfer, but qualified students who are otherwise admissible may receive transfer credit by prescribed procedures. These procedures include credit by examination and/or validation by the appropriate subject matter academic unit on the North Carolina State University campus.

Once applicants have been accepted and have indicated their intention to enroll, their transcripts are evaluated by the college to which application is made to determine the exact amount of credit applicable toward a degree at North

Carolina State. A grade of C or better is required before a course may be considered for credit. *Transcripts are not evaluated until applicant has been admitted.* International students are carefully screened for evidence of English language proficiency, adequate financial backing and academic credential indicating potential for success.

UNCLASSIFIED STUDENTS

Unclassified students are those working for college credit but not enrolled in a degree-granting program. Admission as an unclassified student requires the recommendation of the dean of the school in which the student wishes to enroll. Unclassified students must meet the same entrance requirements as regular degree students and must meet the same academic requirement to continue. If, at a later date, unclassified students wish to change to regular status, their credits will be evaluated in terms of the requirements of their intended curriculum.

LIFELONG EDUCATION STUDENTS

The Lifelong Education Student classification is designed for residents of the Triangle area who have not been formally admitted into a degree program at the University but who wish to enroll in courses offered by the University. Lifelong Education Students are limited to a maximum course load of two courses plus one physical education course each semester or summer session.

Lifelong Education Student applications should be made through the Division for Lifelong Education, at the McKimmon Center, corner of Western Boulevard and Gorman Street. If Lifelong Education Students wish to become degree candidates at a later date, they must make application through the Admissions Office. Lifelong Education Students who are considering a degree program are encouraged to make an appointment with the Admissions Office to discuss entrance requirements.

SERVICEMEN'S OPPORTUNITY COLLEGES

NCSU has been designated as a member of the Servicemen's Opportunity Colleges (SOC) General Registry—a network of institutions sponsored by the American Association of State Colleges and Universities and the American Association of Community and Junior Colleges. Servicemen are encouraged to take college level courses offered by accredited institutions and made available to military personnel through SOC. Records are evaluated, files are retained, counseling is provided, and recognition is given for learning through noninstitutional sources when appropriate. Transcripts must be sent to the Director of Admissions directly from the institution offering the course.

COLLEGE LEVEL EXAMINATION PROGRAM (CLEP)

A national program administered by the College Board, CLEP is a series of examinations that allows students to show knowledge in a wide range of areas. The tests are used to grant credit for corresponding college courses. There are 5 General and 30 Subject Examinations. At NCSU credit is granted primarily for Subject Examination, as these provide a more satisfactory evaluation of subject

matter covered in NCSU courses. Scores and essays, if required, are reviewed and credit granted by the department offering the corresponding course.

Information regarding credit, and testing dates and locations can be obtained in the Counseling Center, 2000 Harris Hall, 737-2423.

CLEP *Subject Examinations* provide a more satisfactory evaluation of material covered in courses offered at NCSU and are, therefore, recommended over the General Examinations.

Both General and Subject Examinations at NCSU are administered during the third calendar line of each month except December and February. It is necessary to register for the examinations at least three weeks before the first of the week in which they are to be given. The examinations are administered through the Counseling Center at N.C. Central University, Durham, N.C. (919) 683-6336.

GRADUATE STUDENTS

Procedures and policies governing graduate admission are outlined in a separate catalog issued by the Graduate School. For a copy of the Graduate School catalog write:

Dean of the Graduate School
104 Peele Hall
Box 7102
North Carolina State University
Raleigh, North Carolina 27695-7102

Orientation

The University provides a series of orientation programs for all new freshmen. Students attend their program with other freshmen who have been admitted to the same college, the University Undesignated Program, or the University Transition Program. Meetings and conferences with faculty and student leaders acquaint new students with the academic opportunities and expectations associated with their chosen curriculum and with the extracurricular activities and organizations available on campus.

For more information, contact the Division of Undergraduate Studies, 206 Holladay Hall (737-7528) or the Department of Student Development, 2007 Harris Hall (737-2443).

REQUIRED IMMUNIZATION DOCUMENTATION

North Carolina state law requires all new enrollees in the university system to present proof of immunization prior to completion of registration.

Verified proof of immunization against rubella, measles, tetanus and diphtheria must be presented to the University Student Health Service no later than 30 days prior to registration.

If this requirement is not met, dismissal from school is mandatory under the law. For assistance, contact the Student Health Service (919 737-2563).

Registration

Registration is conducted by using the Telephonic Registration Access to Computerized Scheduling (TRACS) system. This system allows students to use any touch-tone telephone to register for classes. A *Schedule of Courses* is available for every semester prior to the beginning of the registration period. This contains all necessary instructions for completing registration.

Registration consists of three steps: (1) Meeting with advisers to determine course requirements and to obtain a Personal Identification Number (PIN); (2) Registering for courses using the TRACS system; and (3) Paying tuition and fees and all other debts to the University by the established deadlines. Instructions for completing registration are issued each semester and summer session.

For more information, contact the Department of Registration and Records, 1000 Harris Hall, 737-2572.

INTERINSTITUTIONAL REGISTRATION

A regularly enrolled undergraduate degree student who is enrolled in at least eight credit hours at North Carolina State University may take, under certain conditions, course work at one of the Raleigh colleges, at the University of North Carolina at Chapel Hill, at the University of North Carolina at Greensboro or at Duke University. Interinstitutional registration forms and all registration procedures are available from Registration and Records.

SCHEDULE CHANGES—DROPS AND ADDS

Courses may be added during the first two weeks of a regular semester. All courses may be dropped without regard to course load during the first two weeks of a regular semester. During the third and fourth weeks of a semester, full-time undergraduate students who wish to drop courses at any level and whose academic load would thereby fall below the twelve-hour minimum course load may do so only for documented medical reasons or other verified, unforeseen grounds of personal or family hardship.

For undergraduate students, exceptions to the drop policies require the recommendation of a student's adviser (or the departmental coordinator of advising or the department head) and approval by the dean of the student's college. Students who wish to drop all courses for which they are enrolled, must withdraw from the university for the remainder of the semester or summer term in which they are enrolled.

Tuition and Fees

North Carolina Resident—$522.00 per semester.

Nonresident—$2,773.00 per semester.

A statement of tuition and fees is mailed to each preregistered student before the beginning of any term. The statement must be returned with full payment or complete financial assistance information by the due date appearing on the statement. Normally the due date is two weeks before classes begin. Non-preregistered students are required to pay their tuition and fees at registration. Fees are the same for both residents and nonresidents and are required of all students. Nonresident students are required to pay an additional $2,251 per semester for tuition.

ESTIMATED ANNUAL UNDERGRADUATE EXPENSES

Tuition and Fees	*First Semester*	*Second Semester*	Year
(a) N.C. Residents	$ 522.00	$ 522.00	$1,044.00
(b) Out-of-State Residents	2,773.00	2,773.00	5,546.00
Room Rent	675.00	675.00	1,350.00
Meals	840.00	840.00	1,680.00
Books and Supplies	250.00	250.00	500.00
Other personal expenses	500.00	500.00	1,000.00
TOTAL			
(a) N.C. Residents	$2,787.00	$2,787.00	$ 5,574.00
(b) Out-of-State Residents	$5,038.00	$5,038.00	$10,076.00

NOTE: *All charges are subject to change without notice.*

EXPENSES OTHER THAN TUITION AND GENERAL FEES

Application Fee: A non-refundable fee of $35 must accompany each application for admission.

Room Rent: New incoming students receive room reservation instructions in the letter of acceptance. Continuing students are provided a card with instructions at their residence hall rooms. The 1990-91 charge for room rent ranged from $675 per semester for most residence halls to $965 for North Hall and South Hall.

Meals: During their first academic year, new freshmen electing to reside on-campus are required to participate in one of the university's available meal plans. Meal plan costs in 1990-91 ranged from $840 to $900. Other students pay for meals individually at the various dining facilities available both on and near the campus.

Books and Supplies: Books and supplies are usually purchased during the first week of classes directly from the Students Supply Stores. Allow approximately $250 per semester for purchasing books and supplies.

Personal Expenses: Personal expenses vary widely among students but the estimate of $500 is based on what students report that they spend on these items.

Administrative Management Fee: A special administrative management fee of $250 per semester and $150 per summer session is required from a contracting agency sponsoring international students whose programs are coordinated through the University's Office of International Visitors.

Cooperative Education Program Fee: Required of all participating co-op students for each semester in which they are enrolled in an off-campus work assignment. This fee, set at $145 for the 1990 fall semester, the 1991 spring semester, or the combined 1991 summer sessions, is used for partial support of the Cooperative Education Program staff in job development and placement activities. Students paying this fee are entitled to all university services, facilities, and programs during the semester or combined summer sessions for which they are enrolled.

College of Engineering Computing Fee: Effective with the 1991 fall semester, all students enrolled in the College of Engineering, both graduate and undergraduate, will be billed a $100 per semester fee to support the Engineering Computing Facility. Payment of the fee will provide students with access to standalone workstations which comprise the Engineering Computing Facility.

During the 1991 summer sessions, the 1990 freshman Engineering cohort, and all other students in the College of Engineering who enroll in E 115, CSC 110 and CSC 112 will be billed the Computing Fee at a rate of $35 per session. Beginning with the 1992 summer sessions, all College of Engineering students who enroll in a summer session will be billed the computer fee at a rate of $35 per session. Engineering and computer science students who enroll in ten-week courses will be billed at a rate of $70.

Students who enroll in a COOP work session will not be billed for the Computing Fee unless they also enroll in NCSU courses.

Fees Related to Laboratory and Computer Courses: Students enrolled in designated lab or computer courses must pay a course fee of $25 to offset partially the cost of necessary supplies, equipment, and operation. The maximum course fee to be charged to any student will be $50 per semester or summer session regardless of the number of designated courses taken. These fees will be assessed for courses carried *at the end of the official enrollment period*, i.e., the end of the second week of a semester or the end of the fourth class day during a summer session.

Departments may waive a course fee when: students are auditing a designated course in which the conditions of the audit preclude any usage of lab or computing resources; or students in special projects, independent research, and similar courses which have a designated fee, are not using a university lab course but who mistakenly are registered for the lab section; or students are taking only the lecture portion of a designated lab course but are mistakenly registered for the lab section.

Departments may *not* waive a course fee when: a designated lab or computer fee course is dropped *after the official enrollment date*, or withdrawal from the university occurs *after the official enrollment date*, or state law or policy allows for a waiver of tuition (i.e., faculty/staff, over 65 years of age, exchange programs, etc.)

Students who withdraw from the university *after the official enrollment date* may petition the Fee Appeals Committee, and refunds of course fees will be handled on a prorated basis as are refunds of other fees.

NOTE: *All charges are subject to change without notice.*

REQUIRED FEES

Required fees are levied for services, facilities, and programs available to all students whether or not the student takes advantage of them. Students are assessed fees based on the course load they are taking. An itemization of required fees and other detailed information concerning expenses or related data can be obtained by contacting the University Cashier's Office, Box 7213, Raleigh, North Carolina 27695-7213 (919-737-2986).

REFUND POLICY

A student who officially withdraws from school during the first two weeks of classes will receive receive a tuition and fees refund of the full amount paid less a $25 registration fee. After the two-week period, no refunds will be made.

In some instances, circumstances justify the waiving of rules regarding refunds. An example might be withdrawal because of sickness. Students have the privilege of appeal to the Fee Appeals Committee when they believe special consideration is merited. Applications for such appeals may be obtained from the University Cashier's Office, 1101 Pullen Hall.

RESIDENCE STATUS FOR TUITION PURPOSES

The basis for determining the appropriate tuition charge rests upon whether a student is a resident or a nonresident for tuition purposes. Each student must make a statement as to the length of his or her residence in North Carolina, with assessment by the institution of that statement to be conditioned by the following.

Residence. To qualify as a resident for tuition purposes, a person must become a legal resident and remain a legal resident for at least twelve months immediately prior to classification. Thus, there is a distinction between legal residence and residence for tuition purposes. Furthermore, twelve months legal residence means more than simple abode in North Carolina. In particular, it means maintaining a domicile (permanent home of indefinite duration) as opposed to "maintaining a mere temporary residence or abode incident to enrollment in an institution of higher education." The burden of establishing facts which justify classification of a student as a resident entitled to in-state tuition rates is on the applicant for such classification, who must show his or her entitlement by the preponderance (the greater part) of the residentiary information.

Initiative. Being classified a resident for tuition purposes is contingent on the student's seeking such status and providing all information that the institution may require in making the determination.

Parents' Domicile. If an individual, irrespective of age, has living parent(s) or court-appointed guardian of the person, the domicile of such parent(s) or guardian is, prima facie, the domicile of the individual; but this prima facie evidence of the individual's domicile may or may not be sustained by other

information. Further, nondomiciliary status of parents is not deemed prima facie evidence of the applicant child's status if the applicant has lived (though not necessarily legally resided) in North Carolina for the five years preceding enrollment or re-registration.

Effect of Marriage. Marriage alone does not prevent a person from becoming or continuing to be a resident for tuition purposes, nor does marriage in any circumstance insure that a person will become or continue to be a resident for tuition purposes. Marriage and the legal residence of one's spouse are, however, relevant information in determining residentiary intent. Furthermore, if both a husband and his wife are legal residents of North Carolina and if one of them has been a legal resident longer than the other, then the longer duration may be claimed by either spouse in meeting the twelve-month requirement of in-state tuition status.

Military Personnel. A North Carolinian who serves outside the state in the armed forces does not lose North Carolina domicile simply by reason of such service. Students from the military may prove retention or establishment of residence by reference, as in other cases, to residentiary acts accompanied by residentiary intent.

Active military personnel assigned to North Carolina and their military dependents may be eligible to receive the benefit of the in-state tuition rate under G.S. 116-143.3. A student who qualifies for the in-state tuition rate solely under this statute is not considered a resident but merely eligible for the benefit of the in-state tuition rate. Application for eligibility to be charged the in-state tuition rate under G.S. 116-143.3 must be made prior to initial enrollment or re-enrollment for which the student claims the benefit. Further, application for such eligibility must similarly be made prior to the outset of each successive academic year of enrollment. Appropriate applications for the benefit of the in-state tuition rate are available in the Office of Undergraduate Admissions, 112 Peele Hall.

Grace Period. If a person (1) has been a bona fide legal resident, (2) has consequently been classified a resident for tuition purposes, and (3) has subsequently lost North Carolina legal residence while enrolled at a public institution of higher education, that person may continue to enjoy the in-state tuition rate for a grace period of twelve months measured from the date on which North Carolina legal residence was lost. If the twelve months ends during an academic term for which the person is enrolled at a state institution of higher education, the grace period extends, in addition, to the end of that term. The fact of marriage to one who continues domiciled outside North Carolina does not by itself cause loss of legal residence, marking the beginning of the grace period.

Minors. Minors (persons under 18 years of age) usually have the domicile of their parents, but certain special cases are recognized by the residence classification statute in determining residence for tuition purposes.

(a) If a minor's parents live apart, the minor's domicile is deemed to be North Carolina for the time period(s) that either parent, as a North Carolina legal resident, may claim and does claim the minor as a tax dependent, even if other law or judicial act assigns the minor's domicile outside North Carolina. A minor thus deemed to be a legal resident will not, upon achieving majority before

enrolling at an institution of higher education, lose North Carolina legal residence if that person (1) upon becoming an adult "acts, to the extent that the person's degree of actual emancipation permits, in a manner consistent with bona fide legal residence in North Carolina" and (2) "begins enrollment at an institution of higher education not later than the fall academic term next following completion of education prerequisite to admission at such institution."

(b) If a minor has lived for five or more consecutive years with relatives (other than parents) who are domiciled in North Carolina and if the relatives have functioned during this time as if they were personal guardians, the minor will be deemed a resident for tuition purposes for an enrolled term commencing immediately after at least five years in which these circumstances have existed. If under this consideration a minor is deemed to be a resident for tuition purposes immediately prior to his or her eighteenth birthday, that person on achieving majority will be deemed a legal resident of North Carolina of at least 12 months duration. This provision acts to confer in-state tuition status even in the face of other provisions of law to the contrary; however, a person deemed a resident of 12 months duration pursuant to this provision continues to be a legal resident of the state only so long as he or she does not abandon North Carolina domicile.

Lost but Regained Domicile. If a student ceases enrollment at or graduates from an institution of higher education while classified a resident for tuition purposes and then both abandons and reacquires North Carolina domicile within a 12-month period, that person, if he or she continues to maintain the required domicile into re-enrollment at an institution of higher education, may re-enroll at the in-state tuition rate without having to meet the usual 12-month duration requirement. However, any one person may receive the benefit of this provision only once.

Change of Status. A student admitted to initial enrollment in an institution (or permitted to re-enroll following an absence from the institutional program which involved a formal withdrawal from enrollment) must be classified by the admitting institution either as a resident or as a nonresident for tuition purposes prior to actual enrollment. A residence status classification once assigned (and finalized pursuant to any appeal properly taken) may be changed thereafter (with corresponding change in billing rates) only at intervals corresponding with the established primary divisions of the academic year.

Transfer Students. When a student transfers from one North Carolina public institution of higher education to another, he or she is treated as a new student by the institution to which he or she is transferring and must be assigned an initial residence status classification for tuition purposes.

Prevailing North Carolina Law. General Statute (G.S.) 116-143.1 is the prevailing statute governing residence status classification. Copies of the applicable law and of the implementing regulations are available for inspection in the Office of Undergraduate Admissions, 112 Peele Hall.

Financial Aid

To be considered for assistance by the Financial Aid Office, a student and his or her parents must complete and return for calculation purposes the College Scholarship Service Financial Aid Form (FAF). The form is available from both high school guidance counselors and from the North Carolina State University Financial Aid Office. All *undergraduate applicants for financial aid must* indicate on the FAF that they wish consideration for the Pell Grant. This is done automatically—at no additional charge—if the appropriate Pell Grant items are marked on the FAF. The FAF should be completed preferably by March 1 of the year prior to fall semester enrollment and no later than October 1 of the year prior to spring semester enrollment. Transfers and continuing students should check with the Financial Aid Office regarding any other information which may be needed for aid consideration. North Carolina residents with substantial need should apply for the N. C. Student Incentive Grant by listing College Foundation, Inc., to receive a copy of the FAF. Information about this program is available from the high school counselors, the Financial Aid Office, and College Foundation, Inc. (P.O. Box 12100, Raleigh, N.C. 27605) administrators of the program.

Awards are made to applicants on the basis of financial need, satisfactory academic progress, and timely submission of the FAF to Princeton, N.J. Determination of a student's need is based on estimated educational costs and a consideration of the family's financial strength, which primarily includes consideration of the family's income as well as the student's *summer savings*, size of family, number of children in post-high school institutions, family asset holdings, debts, and other resources that may be available for use such as veterans' benefits, Vocational Rehabilitation assistance, etc.

Aid is available on a non-discriminatory basis to all qualifying students. These awards are usually offered in financial aid "packages" which consist of a combination of scholarship gift aid (grants), loan, and/or work-study award, depending upon the degree of need. Continuing students must have a satisfactory record of academic progress in order to renew their aid. The Policy on Satisfactory Academic Progress for Financial Aid Eligibility is available in the Financial Aid Office. A new application must be submitted each year for continued aid.

NEED-BASED SCHOLARSHIPS FOR FRESHMEN AND CONTINUING STUDENTS

There are a large number of special scholarships which are based upon both demonstrated financial need and academic achievement. These scholarships are administered by the university's Financial Aid Office as well as by various academic departments on campus. Some of these scholarships have curricular, geographic and other restrictions. A list of these scholarships and the specific criteria which may apply to them may be found in the handbook published by the N. C. State Financial Aid Office. Filing the Financial Aid Form by early March will assure that the student is considered for all need-based scholarships for which he/she is eligible.

GRANTS

Pell Grants. All applicants for financial aid who have never received a bachelor's degree must apply for this program. Eligibility for a Pell Grant is determined by the Federal Government.

Supplemental Educational Opportunity Grants. These grants are made from federal funds to undergraduate students from low-income families. They are especially useful in assisting promising students who demonstrate need. These grants are determined by the University's Financial Aid Office.

Minority Presence Grants. Under the Board of Governors' general Minority Presence Grant Program, African-American students may be eligible for special financial assistance if they are residents of North Carolina, enrolled for at least three hours of degree-credit coursework, and demonstrate financial need.

The N. C. Student Incentive Grant. This program provides grants to legal residents of North Carolina with substantial need. Entering freshmen and students who have received the grant before have priority for future grants. Grants range up to $1,500 per academic year.

ATHLETIC GRANTS-IN-AID

Athletic awards are made by the Department of Athletics to students who meet the established qualifications for such awards. These awards are based upon athletic ability, rather than upon need.

LOANS

Perkins Loans (formerly National Direct Student Loans). Both undergraduate and graduate students carrying at least half-time academic loads may be awarded these long-term, low-interest loans. These loans are need-based. Six months after ceasing to be enrolled at least half-time, a student must begin paying interest on his or her loan at 5% per year as well as assuming a $30 per month minimum repayment obligation. In order to establish a repayment schedule, borrowers are expected to have exit interviews at the Student Accounts Office in Suite 1101 Student Services Center just prior to graduation or other termination of studies.

Institutional Loans. A limited amount of other long-term loan money is available in several funds, and loans made therefrom are on essentially the same liberal terms as the Perkins Loans.

Insured Student Loan Programs.

Robert T. Stafford Loan Program (formerly Guaranteed Student Loan): These low interest, deferred payment funds are Federal need-based assistance. Interest rate will vary (approximately 8%). Application for this program begins with the FAF. Further application is necessary through the individual lender and requires college certification. The North Carolina lending agency is College Foundation, Inc. (919) 821-4771.

Supplemental Loan for Students (SLS) and

Parent Loan for Undergraduate Students (PLUS):

These loan programs are designed for independent students (SLS) and for parents of dependent students (PLUS). These programs are not need-based.

Payment options along with interest rates will vary from 10-12%. Application requires college certification and is then submitted to the individual lender. The North Carolina lending agency is College Foundation, Inc. (919) 821-4771.

Emergency Short-Term Loans. These loans are available in small amounts (usually not exceeding $100) to enable any full-time enrolled student with a previous good repayment record to meet unexpected expenses. These loans are usually to be repaid within 30 days and are not extended beyond the end of a term or graduation.

COLLEGE WORK-STUDY PROGRAM

The federally supported College Work-Study Program provides jobs on campus for students who qualify with need in the same manner as is required for scholarship or long-term loan assistance. Though individual pay rates vary with the job, basic hourly pay rates comply with the current minimum wage requirements.

STUDENT EMPLOYMENT SERVICE

The Financial Aid Office coordinates an employment service to assist students with information about the possibilities of part-time or summer work. No particular academic or economic qualifications are required to obtain jobs on-or off-campus outside the College Work-Study Program. A current listing of job openings is maintained at the Financial Aid Office.

A handbook which gives a detailed explanation of the need-based aid application and award process and the types of aid available may be obtained upon request from the Financial Aid Office, 2005 Harris Hall.

Student Housing

North Carolina State University furnishes housing for approximately 7,126 students. The university operates residence halls which house 3,865 men and 2,391 women students. In addition, 300 apartments are available for married students, single parents and graduate students in E. S. King Village, and 15 university-owned fraternity and sorority houses accommodate 570 students.

RESIDENCE HALLS

The residence halls are operated to provide opportunities through a variety of group living experiences which complement and expand the students' educational experiences. Each hall is staffed with selected students, both graduate and undergraduate, who report directly to professionally trained people in their area and to the Director of Housing and Residence Life. Staff members are available to help students initiate programs and activities and to advise and assist residents in any way possible.

Living arrangements in buildings vary. Six high-rise buildings are arranged in suites of four or five rooms that share a bath; the other buildings have a center corridor with rooms opening on to it. Rooms are furnished but students must provide bed linen, pillows and towels.

Eligibility. To be eligible for university housing one must enroll as a regular full-time student (an undergraduate must carry a minimum of 12 credit hours per semester).

NCSU guarantees on-campus housing for the first year to all new freshmen. During the second semester of the freshman year, all resident freshmen participate in a random selection process which determines housing eligibility for subsequent years. Students selected during the housing random selection process are guaranteed housing for their remaining three years. Other upperclass students, including graduate, transfer, and readmitted students are not guaranteed campus housing, but are housed on a space available basis.

Room Costs and Reservations. The room cost for 1989-90 was $650 per semester for main-campus double rooms; this rate is subject to change on a year to year basis.

Cancellation of Housing. Cancellation of housing applications must be made *in writing* as follows:

a. In person at the Housing Assignments Office, Department of Housing and Residence Life, 1112 Pullen Hall, Monday through Friday between 8 a.m. and 5 p.m.; or
b. mail addressed to the Housing Assignments Office, Department of Housing and Residence Life, Box 7315, NCSU, Raleigh, NC 27695-7315.

The effective date of cancellation is the date notification is received by the Housing Assignments Office or the date the room is vacated, whichever is later.

APARTMENTS FOR MARRIED STUDENTS, SINGLE PARENTS, AND GRADUATE STUDENTS

The University operates 300 apartments in E. S. King Village for students with families, single parents and graduate students. The 1989-90 rental is $220 for a studio, $220 for a one-bedroom, and $245 for a two-bedroom including water only (gas is included in studio units). This rate is subject to change on a year to year basis. Information on availability and applications should be requested from Housing Assignments Office, Department of Housing and Residence Life, Box 7315, Raleigh, N.C. 27695-7315.

OFF-CAMPUS HOUSING

Raleigh has a variety of privately owned apartments and houses available for rent to university students. A partial listing is located in the Housing Assignments Office, 1112 Pullen Hall. No listing is published because of the rapid turnover.

The university does not operate a trailer parking area; however, privately owned parks are available within a reasonable distance of the campus.

FRATERNITIES AND SORORITIES

Twenty of the 25 general college fraternities and four of the eight general college sororities chartered at the university maintain chapter houses. Thirteen of the fraternities and two of the sororities are housed on Fraternity Court, a university-owned project; the remaining fraternities and sororities are located throughout the immediate community.

Rental fees vary in fraternity and sorority houses depending on the individual chapter, but are approximately the same as the residence hall rates.

Academic Policies and Procedures

ACADEMIC ADVISING

Every regularly enrolled student is assigned for academic advising to a faculty member who is normally a member of the department which is, or is most likely to become, the student's major department.

Responsibilities of the Student

Students have the primary responsibility for planning their individual programs and meeting graduation requirements. This involves: (1) keeping up-to-date with university, school, and departmental curricular requirements through materials available from the faculty advisers or departmental coordinator of advising; (2) keeping informed of academic deadlines and changes in academic policies; and (3) consulting with the faculty adviser or departmental coordinator of advising during each registration period, following notification of academic warning status, and at other times as needed.

Responsibilities of the Faculty Adviser

Although students have the primary responsibility for planning their programs, faculty advisers are expected to: (1) be available for conferences at appropriate times and places about which their advisees have been informed; (2) provide accurate information about academic regulations and procedures, course prerequisites, and graduation requirements; (3) assist students in planning academic programs suited to their interests and abilities and their career objectives; (4) discuss with their advisees appropriate course choices in fulfilling curriculum requirements as well as possible consequences of various alternative course choices; (5) inform their advisees when the advisee's proposed course selections conflict with university academic or curricular regulations; (6) assist advisees with following proper procedures for such things as exceptions to the course drop deadlines, auditing a course before or after taking it for credit, taking a course under the credit by examination policy, registering for 19 or more credit hours, registering for CRC interinstitutional courses, or repeating a course

previously passed; (7) refer their advisees for special testing or counseling as needed; (8) assist their advisees in considering the appropriateness of academic adjustments where these become necessary in cases of serious injury or illness.

Responsibilities of the Coordinator of Advising

Each college or department has a coordinator of advising who is responsible for: (1) assigning, training, and supervising faculty advisers; (2) providing up-to-date, printed course and curriculum information for advisers and students; (3) reassigning to another adviser any student who so requests; and (4) assisting any student who wants to major in the coordinator's area of study but is ineligible at the time to transfer into it. Students in this category keep their adviser in the department in which they are enrolled but consult additionally with the coordinator of advising for the department offering the curriculum in which they wish to enroll. Whenever appropriate, the coordinator will advise students that they should consider alternative curricula.

CLASSIFICATION OF STUDENTS

Regular undergraduate degree students are classified at the beginning of each semester and summer session. The required number of hours of each classification is:

Classification	*Semester Hours of Earned Credit*
Freshman (FR)	Fewer than 28
Sophomore (SO)	28 or more, but fewer than 60
Junior (JR)	60 or more, but fewer than 92
Senior (SR)	92 or more

Agricultural Institute students are designated as first (01) year if they have earned fewer than 28 semester credits and second (02) year if they have earned 28 or more semester credits.

Unclassified Students (UN) are those working for college credit but not enrolled in a degree-granting program. Admission as an unclassified student requires the recommendation of the dean of the school in which the student wishes to enroll. Unclassified students must meet the same entrance requirements as regular degree students and must meet the same academic requirements to continue. If, at a later date, unclassified students wish to change to regular degree status, their credits will be evaluated in terms of the requirements of their intended curriculum.

Undergraduate Studies (UGS) is the classification used for U. S. citizens who have not obtained a baccalaureate degree and who wish to take courses but who are not currently admitted to a degree program. To be eligible to register as a UGS student, a person should: (a) have acquired a high school diploma or a GED certificate; and (b) not have been suspended from any college or university (including NCSU) for two full semesters not including summer sessions; and (c) not be a degree candidate at NCSU; or (d) be a high school student who has been recommended by his/her school and approved by the Undergraduate Admissions

Office to take lower level courses. Visiting summer sessions students and visiting interinstitutional students do not necessarily have to meet the above criteria.

Post-Baccalaureate Studies (PBS) is the classification used by U.S. citizens who wish to take courses beyond the baccalaureate degree but who are not currently admitted to a degree program. This classification is closed to international students with the following exceptions: (a) spouses of regularly enrolled NCSU degree students; or (b) students enrolled in special programs such as AID, FAO, etc., who are approved in advance by the International Student Office and the Graduate School.

All **UGS** and **PBS** students must register through the Division for Lifelong Education which is located in the Jane S. McKimmon Center for Extension and Continuing Education. *Persons found eligible to study as UGS or PBS students are not to assume that they have received formal admission to the University as either undergraduate or graduate degree candidates.* To become a degree candidate, formal application must be made through the Undergraduate Admissions Office or the Graduate School.

The maximum course load for all UGS and PBS students is two courses plus one physical education course each semester or summer session. They may enroll in any course offered by the University, provided they have satisfied any required prerequisites and space is available. The academic standards applicable to undergraduate degree candidates at the University, including the Suspension Policy, apply to UGS and PBS students.

SEMESTER COURSE LOAD

For undergraduate degree students the maximum course load is 21 credit hours a semester and two courses plus PE in a summer session. To carry more than the maximum, students must obtain the approval of their academic adviser and of their school dean. Undergraduate students who propose to register for 19 or more credit hours a semester must obtain approval from their academic adviser. First semester freshmen with a UPGA of less than 2.0 and continuing students with a GPA of less than 2.0 are advised to carry no more than 16 credit hours a semester.

For undergraduate studies students (UGS) the maximum course load is two courses plus PE in a regular semester or summer session. Exceptions must be approved by the Admissions Office.

The minimum course load for full-time undergraduate degree students is 12 credit hours, except in their final semester when a lesser number may be taken if that is all the student needs to fulfill the requirements for a degree. In all cases, to receive financial aid a student must meet the minimum course load requirements of the appropriate funding agency.

The number of hours for which a student is officially enrolled is that number in which the student is enrolled for credit at the end of the second week of classes (i.e., the last day to withdraw or drop a course with a refund).

GRADING SYSTEM

(Definition of Letter Grades and Grade Points)

Grade	*Definition*	*Grade Points Per Credit Hour*
A	Excellent	4
B	Good	3
C	Satisfactory ("Passing" for graduate students)	2
D	Marginal	1
NC	No Credit	0

(The following grades are not used in the calculation of grade point averages.)

S	Satisfactory (Credit-only and certain other courses)
U	Unsatisfactory (Credit-only and certain other courses)
CR	Credit by Examination or Advanced Placement
IN	Incomplete
LA	Temporarily Late
AU	Audit
NR	No Recognition Given for Audit
W	Withdrawal or Late Drop

Explanation of Letter Grades

D—Marginal. This grade will be used to recognize that a student's performance was marginal but clearly better than that of students who receive NC.

U—Unsatisfactory. This is used to indicate that the student is not to receive credit for a credit-only or other course for which the passing grade would be S *(Satisfactory).*

CR—Credit. This is used by the registrar to indicate course credit received by examination or advanced placement as certified by appropriate departments or schools. This grade shall be awarded only when the advanced placement testing indicates that the quality of the student's work in the course would have been expected to be of C or higher level.

IN—Incomplete. This is a temporary grade. At the discretion of the instructor, students may be given an IN grade for work not completed because of a serious interruption in their work not caused by their own negligence. *An IN must not be used, however, as a substitute for an NC when the student's performance in the course is deserving of No Credit. An IN is only appropriate when the student's record in the course is such that the successful completion of particular assignments, projects, or tests missed as a result of a documented serious event would enable that student to pass the course. Only work missed may be averaged into the grades already recorded for that student.*

An IN grade must be made up by the end of the next regular semester (not including summer sessions) in which the student is enrolled, provided that this period is not longer than twelve months from the end of the semester or summer session in which the work was due. In the event that the instructor or department offering the course is not able to provide a student with the opportunity to make up the incomplete work by the end of the next regular semester in which the student is enrolled or within twelve months, whichever is shorter, the instructor

or department offering the course must notify the student and the Department of Registration and Records of the date of the extended deadline for removing the IN grade.

Any IN grade not removed by the end of the next regular semester in which the student is enrolled or by the end of twelve months, whichever is shorter, or by the extended deadline authorized by the instructor or department offering the course and recorded by the Department of Registration and Records will automatically become a No Credit (NC) grade and will count as a course attempted.

Students must not register again for any courses in which they have IN grades; such registration does not remove IN grades, and the completion of the course on the second occasion will automatically result in an NC for the incompleted course.

LA—Temporarily Late. The LA is an emergency symbol to be used only when grades cannot be reported by the teaching department or the professor on time. The LA differs from the IN grade in that the student receiving the LA has completed the work of the course including the examination.

AU—Audit. This is used to indicate that a student has successfully audited a course by attending class regularly and completing the instructor's requirements.

NR—No Recognition Given for Audit. This grade is given if the instructor concludes that the auditor has gained little from the course due to poor attendance or failure to fulfill the instructor's requirements.

W—Withdrawal or Late Drop. The W will be used to indicate on all students' academic records all courses for which they have received official approval to drop or from which they have received official approval to withdraw after the deadlines for dropping 100- through 400-level or 500- and 600-level courses.

GRADE POINT AVERAGE

The number of credit hours attempted in a semester or summer session (for which grades of A, B, C, D, or NC are received) is divided into the total number of grade points earned to arrive at the Grade Point Average (GPA). The Grade Point Average will be calculated to three decimal points.

For example, if a student takes 16 credit hours, earning an A in two 3-credit courses, a B in one 3-credit course, and a B in one 2-credit course, a C in a 3-credit course, and a NC in a 2-credit course, the grade point average would be:

6 (credits of A)	x 4 (grade points per credit hour) = 24
5 (credits of B)	x 3 (grade points per credit hour) = 15
3 (credits of C)	x 2 (grade points per credit hour) = 6
2 (credits of NC)	x 0 (grade points per credit hour) = 0
	45

The total number of grade points earned (45) divided by the number of credit hours attempted (16) equals the grade point average in this case 2.813.

ACADEMIC HONORS

High ranking students in their freshman year are eligible for membership in **Phi Eta Sigma** and **Alpha Lambda Delta**. Both of these national scholastic honoraries require a 3.5 semester grade point average or better during the first semester or a cumulative average of 3.5 for both semesters during the freshman year. Juniors ranking in the top three percent of their class, seniors ranking in the top sixth of their class and outstanding graduate students are eligible for election to membership in **Phi Kappa Phi**, a national scholastic honor society.

Semester Dean's List—A full-time undergraduate student who earns a semester average of 3.5 or better on 12 to 14 hours of course work for which grade points are earned or a semester average of 3.25 or better on 15 or more hours of course work for which grade points are earned shall be placed on the Dean's List for that semester.

Students are not eligible for the Dean's List in any semester in which they receive an NC or IN grade. When IN grades are resolved, however, students who are otherwise eligible shall be added retroactively to the Dean's List for that semester. Dean's List recognition shall be noted on the student's semester grade report and permanent academic record.

Graduation with Honors—Undergraduate degree honor designations are:
Cum Laude—for GPA 3.250 through 3.499
Magna Cum Laude—for GPA 3.500 through 3.749
Summa Cum Laude—for GPA 3.750 and above
To be eligible for degree honor designations students must have completed at least two semesters *and* at least 30 credit hours at NCSU.

Valedictorian, Salutatorian, and Highest Ranking Scholar in a College—To be eligible for consideration as valedictorian, salutatorian, or highest ranking scholar in a college, an undergraduate student must have received at least 100 academic credits at North Carolina State University (including credit by examination, advanced placement credit, and S/U courses.) These 100 credits may include no more than 20 transfer credits through programs officially sponsored by North Carolina State University. Specifically, these programs are Cooperating Raleigh Colleges, National Student Exchange, International Student Exchange, NCSU sponsored study abroad programs, and the affiliated hospital programs in Medical Technology.

All students whose accumulated grade point averages, based on all courses attempted at North Carolina State University, make them eligible for one of these honors shall be so recognized. That is, in the case of ties, more than one student will receive the honor. However, in the case of ties for valedictorian, no salutatorian will be recognized.

GRADE REPORTS

At the end of each semester or summer session, Registration and Records issues a grade report showing all grades earned during that grading period, as well as the record of all previous work taken at this university.

As part of the registration process students will be asked to verify and/or complete an address form giving a mailing address to which grade reports and other university correspondence will be mailed. Students have the choice of having their grade reports sent either to their parents or guardians, or directly to themselves.

Change of Name or Address—It is the student's responsibility to inform Registration and Records of any changes in name or address. Failure to do this may prevent prompt delivery of important university correspondence. Also, news stories about Dean's List students are sent to N.C. newspapers based on hometown information furnished Registration and Records.

ACADEMIC WARNING

All undergraduate students, including Lifelong Education student, who enroll in NCSU for the first time in the 1990 Summer Sessions or thereafter will be subject to the Academic Warning policy set forth below. Beginning at the end of the 1994 fall semester, all undergraduate students, regardless of when they first enrolled in NCSU, will be subjected to this policy:

At the end of any regular semester or summer session a notice of "ACADEMIC WARNING" shall be placed on the grade report of any undergraduate student who is not suspended at that time but whose cumulative GPA for courses taken at NCSU is less than 2.00.

"ACADEMIC WARNING I" shall mean that a student's cumulative GPA at NCSU is less than 2.00 but greater than that which would result in Academic Warning II on the graduated retention schedule. Academic Warning I shall be assigned to those students who have:

1-35 credit hours attempted with a cumulative GPA greater than or equal to 1.60 but less than 2.00
36-47 credit hours attempted with a cumulative GPA greater than or equal to 1.70 but less than 2.00
48-59 credit hours attempted with a cumulative GPA greater than or equal to 1.80 but less than 2.00
60-71 credit hours attempted with a cumulative GPA greater than or equal to 1.90 but less than 2.00

"ACADEMIC WARNING II" shall mean that a student's cumulative GPA at NCSU is below the minimum required for continuation under the next step in the graduated retention schedule. It shall be assigned to those students who have:

1-35 credit hours attempted with a cumulative GPA greater than or equal to 1.50 but less than 1.60
36-47 credit hours attempted with a cumulative GPA greater than or equal to 1.60 but less than 1.70
48-59 credit hours attempted with a cumulative GPA greater than or equal to 1.70 but less than 1.80
60-71 credit hours attempted with a cumulative GPA greater than or equal to 1.80 but less than 1.90

72-83 credit hours attempted with a cumulative GPA greater than or equal to 1.90 but less than 2.00

NOTE: "Credit hours attempted" in this policy means the total credit hours attempted at NCSU plus transferred credit hours from other institutions.

ACADEMIC SUSPENSION POLICY

All undergraduate students, including Lifelong Education students, who were enrolled in NCSU at any time prior to the 1990 Summer Sessions, will be subject to the Suspension policy set forth below. Beginning at the end of the 1994 fall semester, all undergraduate students, regardless of when they first enrolled in NCSU, will be subject to this policy:

The minimum eligibility standard for continued enrollment for any undergraduate student is defined as maintaining the required grade point average (GPA) for the number of credit hours attempted at NCSU plus transferred credit hours according to the following retention schedule:

Credit hours attempted plus transferred credit hours	Minimum cumulative GPA required on all courses taken at NCSU
1-35 hours	1.50
36-47 hours	1.60
48-59 hours	1.70
60-71 hours	1.80
72-83 hours	1.90
more than 83 hours	2.00

PROBATION will be assigned to those students who fail to achieve the minimum cumulative GPA required under the retention schedule. Students on *probation* will be allowed to enroll for one additional regular semester for the purpose of achieving the minimum cumulative GPA as required under the retention schedule. Students on *probation* are not considered to be in good academic standing.

PROBATION signifies that serious deficiencies are present in a student's academic performance. Students on *probation* or ACADEMIC WARNING II will be required to have their academic records reviewed by their departmental academic adviser and the associate dean in their respective colleges before the end of the second week of the *probation* semester.

SUSPENDED will be assigned to those students who fail to achieve the minimum cumulative GPA required under the retention schedule following a semester on *probation.*

Suspended students who are attending a summer session for the purpose of improving their academic standing in order to regain eligibility for readmission to NCSU will have their suspension continued unless their performance in that summer session is sufficient to make them eligible for automatic readmission.

Students will not be suspended at the end of a summer session nor at the end of their first regular semester at NCSU.

WITHDRAWAL FROM THE UNIVERSITY

An official withdrawal means that a student is allowed to drop, without academic penalty, all of the courses for which he/she is registered in a given semester or summer session. For each semester, the official academic calendar indicates the dates for withdrawing with a refund (less a registration fee) and for withdrawing without academic penalty. After the refund deadline, prorated refunds will only be authorized by the Fee Appeals Committee for medical or unusual hardship cases. After the official withdrawal period, withdrawals without academic penalty are granted only for unforeseeable, unavoidable and exceptional grounds.

The student's record will show the date of withdrawal followed by a list of the registered courses marked with a "W", but academic grades and quality points are not recorded. Regular (degree candidate) undergraduate and unclassified students initiate the official withdrawal process with the Counseling Center, 200 Harris Hall. Special (i.e., UGS and PBS lifelong education) students initiate their withdrawal process with the Division of Lifelong Education, McKimmon Center.

For degree students, some colleges may require approval or notification of the Dean within the official withdrawal period. In cases of withdrawals granted for hardship reasons, Dean's approval, and in some cases, approval of the advisor and/or coordinator-of-advising is required. Cases of withdrawals granted for medical or emotional reason must be approved by the Counseling Center after evaluation of available documentation or special situation.

Parential approval to withdraw may be required for single students who are under eighteen. Withdrawal during a semester does not constitute a break in residency if the student returns the semester immediately following. In cases where a student has obligations to the university for such matters as housing, board plan and financial aid, the withdrawal will not be processed by Registration and Records until the student has officially cleared the obligations. It is highly recommended that students considering withdrawal consult their faculty advisor or departmental coordinator-of-advising before initiating the withdrawal process.

READMISSION OF FORMER OR SUSPENDED DEGREE STUDENTS

A *Former Degree Student Returning* is one who was not in attendance at all during the fall or spring semester prior to applying for readmission. All former degree students returning, both graduates and undergraduates, must apply for readmission to the Department of Registration and Records, North Carolina State University, Box 7313, Raleigh, North Carolina 27695-7313. Readmission applications should be submitted as soon as possible but no later than 30 days prior to the date of desired enrollment. Former students returning should be aware that enrollment restrictions may be imposed at any time which may affect their readmission. A student who received a bachelor's degree must (a) apply for admission to the Graduate School; or (b) apply for acceptance as a Post-Baccalaureate Studies (PBS) Student through the Division of Lifelong Education; or (c) apply for readmission as a candidate for a second bachelor's degree or for a professional degree or as an undergraduate Unclassified Student. Registration alone is not sufficient to enable the student to be readmitted.

Readmission of Former Degree Students

Students who were eligible to continue at North Carolina State University at the time of their leaving are eligible to be readmitted to their former program provided they have a grade point average of 2.00 on all courses taken at NCSU and provided there is space available.

Students who were eligible to continue at North Carolina State University at the time of their leaving and who have a grade point average of less than 2.00 on all courses taken at NCSU may be determined to be eligible for readmission through one of the following procedures:

a. Students whose grade point average on all courses taken at NCSU is less than 2.00 but greater than that required for continuation under the next step in the graduated suspension policy are on Academic Warning I. Application for readmission from former students who are or would be on Academic Warning I will be reviewed.
b. Students whose grade point average on all courses taken at NCSU is less than that required for continuation under the next step in the graduated suspension policy but who are not suspended are on Academic Warning II. Applications for readmission from former students who are or would be on Academic Warning II will be reviewed.
c. Former students whose grade point average on all courses taken at NCSU is such that they were or would have been suspensed will have their applications for readmission reviewed by the University Admissions Committee. If readmitted, their academic status will be Academic Warning II.

Former students whose hours attempted at NCSU plus transferred hours total 160 or more will have their application for readmission reviewed in consultation with the appropriate college dean. If readmitted, they will be notified of any applicable conditions with regard to their making appropriate progress toward fulfillment of degree requirements.

Readmission of Suspended Students.

a. *Automatic Readmission.* Students who are academically suspended may do one one or both of the following: (1) attend any number of summer sessions at NCSU; (2) enroll in NCSU Independent Study by Extension courses (formerly called correspondence courses) offered through the UNC Extension Division (Address: Independent Study by Extension, 101 Abernethy Hall, Campus Box 3420, UNC, Chapel Hill, N.C. 27599-3420, Phone: 919-962-1106.

NOTE: Only NCSU courses offered at NCSU summer sessions or NCSU courses that are a part of the Independent Study by Extension program may be used by suspended students to regain eligibility for automatic readmission. Courses taken at an institution other than NCSU or offered by some other institution through Independent Study by Extension do not affect a student's suspension status at NCSU.

When by one or both of these methods a suspended student has improved his or her academic standing to the extent that the student is no longer academically suspended, that student becomes automatically eligible for

readmission to a regular semester and no letter of appeal to the University Admissions Committee by the student is necessary.

b. *Appeal to the University Admissions Committee.* A student who is academically suspended, who is ineligible for automatic readmission as described above, and who feels that extenuating circumstances contributed to that suspension, may appeal to the University Admissions Committee for readmission to a regular semester. A letter must be written to the Committee stating:
   1. the reasons for former academic difficulty with an explanation of extenuating circumstances;
   2. why the student believes he or she can now successfully meet all degree requirements within a reasonable length of time;
   3. the summer sessions or Independent Study by Extension courses that have been completed; and
   4. the address and telephone number to be used for notification of the Admissions Committee's decision.

   NOTE: *The Admissions Committee will not act on the appeal of any student currently enrolled in any Summer School or Independent Study by Extension courses. Suspended students whose hours attempted at NCSU plus transferred hours are equal to or greater than 160 must be recommended by their deans for continuation or readmission before the Admissions Committee will review an appeal.*

   The letter should be mailed to: Department of Registration and Records, Attention: Admissions Committee, North Carolina State University, Box 7313, Raleigh, N.C. 27695-7313. The letter must reach the Department of Registration and Records by the following deadlines:
   1. *No later* than 2 weeks before the first day of classes for the fall semester for students who did not attend summer school or who attended first summer session only;
   2. *No later* than 1 week before the first day of classes for the fall semester for students who attended second summer session.
   3. *No later* than 1 week before the first day of classes for the spring semester.

   NOTE: *The Admissions Committee meets prior to the first day of classes. All material must be received in accordance with the above dates.*

c. *Appeal to the University Admissions Committee by Students Who Have Not Been Enrolled at NCSU for Three or More Years.*

   After not being enrolled at NCSU (excluding summer sessions and independent study) for a continuous three-year period or longer, a student whose former academic record at NCSU was such that he or she was suspended or would have been suspended or placed on Academic Warning II under current policies may petition the University Admissions Committee for contractual readmission.

   The Committee will decide each case on its individual merits with special regard to the student's written appeal, the productive use of the three or more intervening years, evidence of motivation and achievement based on

any academic work done during those three or more years, and a supporting letter from the department offering the curriculum into which the student requests admission. This letter must contain a proposed plan of study agreed to and signed by the student, the department head, and the dean. If the curriculum into which the student requests admission is different from that in which the student was last enrolled, the petition to the Admissions Committee must also be accompanied by a Curriculum Change Form approved by the accepting dean.

If a contractual readmission is approved, the following conditions will apply:

1. The student's entire academic record at NCSU will be recorded on any subsequent transcript, including a GPA on all work attempted at NCSU;
2. For courses attempted prior to readmission, only work of "C" or better will count toward fulfilling graduation requirements, providing that such courses meet current curriculum requirements;
3. For purposes of suspension and graduation, a second GPA will be calculated based only on courses that are attempted after readmission. Total hours for graduation and suspension will be based on all work at NCSU after readmission plus former work of C or better that is acceptable to the department plus hours transferred from other institutions.
4. The student must maintain an overall GPA of 2.0 or better on all courses attempted after readmission.
5. Students who fail to achieve an overall GPA of 2.0 required in #4 above will lose their contractual readmission status. Their status for subsequent work as a degree student at NCSU shall be determined on the basis of total hours attempted at NCSU plus transferred hours, and their GPA calculated using all courses attempted at NCSU.
6. A student may be readmitted under this option only once.

Intra-Campus Transfers (curriculum change).

A former student returning who desires a change of curriculum must have his or her records transferred to the new college and submit a properly validated Curriculum Change Form to the Department of Registration and Records, 1000 Harris Hall, before readmission can be processed.

TRANSFER CREDIT

Transcripts of college course credit for new transfer students and for North Carolina State University students who have taken course work at another institution are evaluated by the dean of the appropriate school to determine how the work applies toward fulfilling the graduation requirements of each student's intended curriculum.

Students admitted to an NCSU undergraduate degree program who wish to take courses at another institution must obtain prior endorsement from their academic department and prior written approval from their school dean in order to insure that the transfer credits will apply toward fulfilling specific graduation requirements.

Transfer credit is not recorded on former students' permanent records until after they have been readmitted and have reenrolled.

REPEATING COURSES

Students who repeat a course, regardless of the grade previously made, will have both grades counted in their cumulative Grade Point Average, except as indicated below. Undergraduate students may be allowed as many semester hours as are appropriate in the departmental curriculum for courses that: 1) are titled *seminar, special problems, special topics, independent study* or *research* (usually numbered 290-299, 490-499 or 590-599) and 2) cover topics different from those studied when the courses were previously taken. Unless a course satisfies one or the other of the above conditions, the semester hours will be counted only once toward the number of hours required for graduation even though students repeat and pass the course both times.

The adviser's approval is required for students to repeat any course previously passed with a C or better. Such approval should not be given when students wish to repeat a course which they have already passed with a grade of A or B. Nor should it be given when: 1) students wish to repeat a lower division course that they have passed with a grade of C or better after having successfully completed an advanced course covering the same material, 2) students wish to repeat a lower level course that they have passed with a C or better which is a prerequisite for an advanced course that they had already successfully completed, (3) students wish to take an introductory course after they have successfully completed an advanced course dealing with similar material, or (4) students wish to repeat a course in which they have an outstanding grade of IN.

Students must not register again for any courses in which they have IN grades. Such registration does not remove IN grades, and the completion of the course on the second occasion will automatically result in an NC for the incompleted course. For information, contact the Department of Registration and Records, 1000 Harris, 737-2572.

A student is eligible to repeat without penalty a maximum of three courses (but not more than 12 credit hours) at the 100- and/or 200-level provided all of the following criteria have been satisfied: (1) each course to be repeated was completed for the first time in the 1984 fall semester or during any regular semester or summer session thereafter at NCSU, (2) the student received a grade of D or NC on each course to be repeated, and (3) the student completes each repeated course at NCSU no later than twelve months from the date on which he or she completed the course on the first enrollment or when the course is next offered, whichever is later. (4) The student can receive the benefits of this policy only once for each course repeated.

To repeat a course without penalty under this policy means that an eligible student who completes for the second time a 100- or 200-level NCSU course may have the grade points and the credit hours attempted and earned on the first completion of the course removed from the calculation of his or her cumulative GPA, and from the calculation of the total hours attempted under the provisions of the suspension policy. The course title and grade on the first completion will continue to be shown on the official record.

CREDIT BY EXAMINATION

Undergraduate students currently registered at NCSU (degree, unclassified, or special) may request an examination for course credit in a course whether enrolled in that course or not, under the conditions described below. Students must initiate a request with their adviser (except when a teaching department awards credit based upon group testing for placement purposes). Should the adviser approve, the student must arrange for the examination with the department offering the course. The department may administer the examination in any manner pertinent to the materials of the course. Departments are encouraged to offer credit by examination in all courses but have the prerogative of excluding certain courses which are demonstrably unsuited for credit by examination.

The academic standards for credit by examination will be commensurate with the academic standards for the course. If a student's performance on the examination is judged to be of C or higher quality, the department will notify the Department of Registration and Records on a Grade Change Report that the student has received Credit by Examination for the course. The Department of Registration and Records will enter the appropriate number of credit hours on the student's permanent academic record. Credits earned through Credit by Examination are not used in the computation of a student's grade point average.

The Department of Registration and Records will post course credit by examination to a student's permanent academic record only if that student is currently registered at NCSU. However, if the course credit by examination would enable a student to complete the requirements for a degree, that student would not have to be registered in order to receive the credit.

If a student fails to achieve C or higher quality work on an attempted credit by examination, no action is required other than the department's notifying the student. However, that student is not eligible for another such examination in the same course.

Once a student has failed a course or has completed for credit or audited more than fifty percent of a course, the student may not attempt credit by examination for that course. Under unusual circumstances, exceptions may be made upon the written recommendation of the student's adviser and the approval of the department offering the course. A student who receives credit by examination in a course in which that student is currently enrolled must officially drop that course no later than mid-semester.

CREDIT BY EXAMINATION THROUGH INDEPENDENT STUDY

Persons who are not currently enrolled on campus and who have gained through study or experience, knowledge of the content of undergraduate credit courses offered through Independent Study may (with the approval of the Independent Study staff and the academic department offering a course) receive credit for that course by special examination. Students may request approval to attempt credit by examination by completing and submitting a form available from the Independent Study Office, 114 Abernethy Hall, Box 3420. UNC-CH, Chapel Hill, N.C. 27599-3420 (962-1106).

Currently enrolled students are not eligible for credit by examination through Independent Study. These students should go directly to the appropriate academic department to request credit by examination under the regular procedures in effect on campus.

CREDIT-ONLY OPTION FOR FREE ELECTIVE COURSES

Each undergraduate student has the option to count toward graduation requirements a maximum of 12 semester hours in the category of credit-only courses (exclusive of courses authorized to be graded on Satisfactory-Unsatisfactory basis). The student may select as credit-only any course offered by the university except those in Military Science and Aerospace Studies. Selected course must be included under the free elective category of the specified curriculum in which the student is enrolled. The student will be responsible for attendance, assignments, and examinations.

The student's performance in a credit-only course will be reported as S (satisfactory grade for credit-only course and given when course work is equivalent to C or better) or U (no-credit grade for credit-only course). The grade for a credit-only course will have no effect on the student's Grade Point Average. The course and its grade will be counted in the cumulative hours attempted. *Credit-only courses do not count in the calculation of eligibility for the Semester Dean's List, which requires either twelve hours or fifteen hours of course work for which grade points are earned.*

Lifelong Education Students may take on a credit-only basis any course for which they satisfy prerequisites.

AUDITS (UNDERGRADUATE)

Students wishing to audit a course before or after taking it for credit must have the approval of their adviser and of the department offering the course. Auditors are expected to attend class regularly. The degree to which an auditor must participate in class beyond regular attendance is optional with the instructor; any such requirements should be clearly explained in writing to the auditor at the beginning of the semester. Should the instructor conclude that poor attendance has resulted in an auditor's gaining little from the course, the instructor should mark NR (no recognition given for an audit) on the final grade report. Students who have taken a course for audit may, with their adviser's approval enroll in the course for credit during a subsequent semester or summer session. For tuition cost purposes, audits are treated as full credit value. For all other purposes, hours of audit do not count in calculating undergraduate course loads.

NOTE: *Veteran's benefits are governed by Veterans Administration regulation concerning audits. Public Law 94-502 (G.I. Bill) and Public Law 634 (sons and daughters of deceased or disabled veterans) consider only courses being taken for credit when determining a student's load for benefit purposes. See Veterans Affairs Office, Harris Hall.*

INTRA-CAMPUS TRANSFERS

Undergraduate students wishing to change from one curriculum to another must report to the dean's office of the college offering the curriculum in which entrance is desired and request acceptance into the new college or curriculum.

A student who has attempted fewer than twelve credit hours at NCSU may transfer to another curriculum provided that student meets the admission requirements of the intended new curriculum. A student who has attempted twelve or more credit hours at NCSU may transfer to another curriculum provided that student is eligible to do so under the intra-campus transfer policy which pertains to the intended curriculum.

If acceptance is approved, a Curriculum Change Form will be issued, bearing the signature of the accepting dean. If the former curriculum was in a different school, the Curriculum Change Form should be submitted for the signature of the releasing dean with the request that all records be transferred to the new college and department. From the standpoint of advising, registration, and adding and dropping courses, the student is considered to be in the new curriculum as soon as the Curriculum Change Form is completed and filed with the Department of Registration and Records and the records of the student have been transferred to the new department.

Code of Conduct

All students who enroll at North Carolina State University are required to adhere to the Student Body Code of Conduct. This code prescribes that University students must not lie, cheat, or steal nor exhibit behavior which does not reflect the standards of the Student Body. Students charged with and found guilty of committing such acts will be subject to disciplinary action. Sanctions include oral reprimand, written reprimand, in-kind restitution, restriction of privileges, disciplinary probation, disciplinary eviction, interim suspension, suspension, and expulsion.

Student Services

ACCIDENT AND HEALTH INSURANCE

The university offers a student accident and health insurance program. The insurance covers the surgical, accident, and hospital needs of the student as a supplement to the Student Health Service. Each year complete information will be made available to students before school opens.

Health Educators offers a variety of information, programs and services to students. Health topics include weight-control, alcohol and drug education, stress management, first aid, sexually transmitted diseases, women's issues and more.

CAREER PLANNING AND PLACEMENT CENTER

The Center offers assistance to all students at the university on a year round basis. Advice on the relationship of professional goals to various programs of study and assistance in identifying individual aptitudes and abilities affecting career potential are available. Students are encouraged to participate in a Career Planning Workshop in the freshman or sophomore year.

The center coordinates job interviews between students and employer representatives. Seniors are urged to use this placement service for interviewing with potential employers. The staff also recommends contacts with employers not scheduled to visit the campus.

COUNSELING

The Counseling Center assists individuals in gaining a better understanding of themselves. Psychologists, professional counselors, and psychiatrists are available to work with students who desire assistance with concerns such as: choosing a career; academic planning; identifying and overcoming educational difficulties; developing greater self-understanding; developing more satisfying personal relations; and coping with stress or emotional crisis. All counseling is strictly confidential.

In addition to one-to-one and group counseling for individuals and couples, workshops are offered throughout the year in a variety of areas, including vocational exploration, study skills, anxiety-reduction, and assertive behavior.

Counseling services are available without cost to all enrolled NCSU students, and some services are available to prospective students. Appointments may be scheduled over the telephone by calling 737-2424 or in person by coming to 200 Harris Hall. (Evening appointments are available.)

FOOD SERVICE

Meal Plans. University Dining's meal plans offer students flexibility and convenience. The four meal plan choices are: the Gold Card, 20-meal plan, any-15 meal plan, and 15-meal plan M-F. Participation in the meal plan program is required for all freshmen living on campus. Students other than freshmen may participate as space permits.

Dining Services. University Dining operates 15 locations across campus offering a wide variety of food choices. The Dining Hall serves as the main hub for the meal-plan programs and offers an all-you-can-eat menu. Also located on campus are convenience stores, ice cream parlors, a deli, cafeteria-type areas, the catering division, and the Special Edition steakhouse. A debit card program, the AllCampus Money Card, provides the opportunity to eat in all areas of the campus without carrying cash.

HANDICAPPED STUDENTS

Students requiring special assistance because of visual, hearing, learning or motor handicaps should contact Handicapped Student Services, NCSU, Box

7312, Raleigh, NC 27695-7312 (200 Harris Hall), 737-7653. Interpreter, tutorial, notetaker and/or reader services are available by contacting the center.

Direct services for all learning disabled students, such as assessment, educational counseling, and arrangements for appropriate academic support can also be initiated by the Handicapped Student Services.

Those students needing special assistance in scheduling courses should make contact as far as possible in advance of preregistration deadlines.

HEALTH

The university seeks to safeguard the health of the students in every way possible. The Student Health Service, located in Clark Hall Infirmary, offers medical care to students on an outpatient and inpatient basis. The facility is staffed by full-time physicians, registered nurses and other medical support personnel.

During most of the fall and spring semesters, the Health Service is open 24 hours a day, seven days a week. Only an outpatient clinic is operated during the summer session, some student holidays, and semester breaks. Physicians maintain regular office hours Monday through Friday and are on call at all times to assist the nurses on duty when a patient's condition warrants immediate attention.

All registered students pay a medical fee which covers both inpatient and outpatient professional services; i.e., visits to nurse or M.D., routine laboratory procedures and some medications available in the student pharmacy. There is a nominal charge for x-rays, some lab tests, allergy injections, some medications and special clinics. Students are responsible for the cost of laboratory tests and x-rays which must be performed by an off-campus agency, medications not available in the student pharmacy, and expenses incurred when referred to an off-campus M.D. or hospital.

All health and medical information is confidential and is not divulged to anyone without the written consent of the patient.

LAUNDRY AND DRY CLEANING

The University operates a laundry and dry cleaning facility on campus at reasonable prices. Branch offices are located in the residence halls for the convenience of the students.

LINEN RENTAL PROGRAM

The NCSU Laundry offers a special linen rental package to incoming students. The Laundry will provide two sheets, three towels, and a crisp pillow case each week. New standard size pillows are also available.

Linen Rooms are located in Becton, Bowen, Lee, Owen, Syme, and at the main Laundry on Yarborough Drive. Throughout the school year, the Linen Rooms in the residence halls are open five days a week to accommodate your needs for clean linen.

CLOTHESLINE PROGRAM

The NCSU Laundry and Dry Cleaners also offers the CLOTHESLINE Program, which provides wash/dry & fold service for 135 pounds of laundry, wash and press service for 75 shirts or blouses, and dry cleaning of 15 items per semester. It is a convenient way to keep clothes clean and neat, and payment is only required once (at the beginning of the school year.)

In addition to bringing laundry to the main facility on Yarborough Drive, CLOTHESLINE members may drop off and pick up laundry and cleaning at one of the linen rooms located in the residence halls mentioned above.

NCSU BOOKSTORES

The official campus source for all course-books is NCSU Bookstores, consisting of the main store, located on East Dunn Avenue, and the North Campus Shop, located in the lower level of Erdahl-Cloyd Annex of the D. H. Hill Library. At the main store, the book division provides textbooks, fiction, non-fiction, technical and reference titles, publishers' overstock and remainders, college outlines, paperbacks, book reviews, periodicals and calendars. The merchandise division carries school supplies, personal computers with accessories and supplies, art and engineering supplies, greeting cards, health and beauty aids, imprinted sportswear, souvenirs, and convenience items. Special orders are accepted for books and merchandise. Purchases may be charged by VISA, MasterCard, or AllCampus Money Card. During the opening of fall and spring semesters, the main store is open specified evenings, in addition to each Tuesday evening and Saturday when classes are in session. North Campus Shop specializes in computer supplies, sale books, magazines, college outlines, greeting cards, souvenirs, gifts, and convenience items. The entire operation of NCSU Bookstores is completely self-supporting, with its annual surplus transferred to NCSU Scholarship Fund.

TRANSPORTATION

There are very few parking spaces for the number of people with on campus parking needs; therefore, students are encouraged to use transportation other than personal automobiles. There are various alternatives that may be chosen such as motorcycles, mopeds, bicycles, and carpools. Each alternative is both economical and convenient.

Students living off campus in nearby apartment complexes may elect to use Wolfline, the University's special transit service. The Capitol Area Transit Service (CAT) is available for students living throughout Raleigh.

Any student parking a car on campus is required to have a permit. Freshman residents and off-campus students living within a one mile radius of campus are not eligible for campus parking permits. Continuing students are encouraged to register for the appropriate parking permit during the Permit Pre-registration Program offered each spring. Any person who brings a vehicle on campus is responsible for compliance with campus Parking and Traffic Rules and Regulations.

For more information on parking and transportation, please contact the Division of Transportation, NCSU Campus. Box 7221, Raleigh, North Carolina, 27695-7221, (919) 737-3424.

Student Activities

The University makes every effort to provide surroundings which are pleasant and conducive to intellectual growth. In addition, a wide variety of athletic, cultural, and social opportunities are available to students. Through the services and activities affiliated with campus life, as well as through extra-curricular organizations and functions, the student at N.C. State may acquire experience in group leadership and community living to supplement and enrich the academic component of his/her education.

STUDENT GOVERNMENT

Every NCSU student is a member of a community which exercises executive, legislative, and judicial authority in matters of student affairs. Students have a voice in government through participation in campus-wide elections of officers, legislators, and judiciary members.

CLUBS AND SOCIETIES

Honorary. University-wide honorary societies include Golden Chain, senior leadership; Thirty and Three, junior leadership; Phi Eta Sigma and Alpha Lambda Delta, freshman scholarship; Gamma Beta Phi, scholarship and service; and Phi Kappa Phi, junior, senior, and graduate student scholarship.

Professional and Technical Organizations. The colleges and departments of the university sponsor or supervise a large number of professional and technical societies and clubs. These organizations contribute substantially to students' professional and social growth.

Fraternities and Sororities. Twenty-five national general college fraternities have chapters at State. They are Alpha Gamma Rho, Alpha Phi Alpha, Delta Chi, Delta Sigma Phi, Delta Upsilon, FarmHouse, Kappa Alpha, Kappa Alpha Psi, Kappa Sigma, Lambda Chi Alpha, Omega Psi Phi, Phi Beta Sigma, Phi Delta Theta, Phi Kappa Tau, Pi Kappa Alpha, Pi Kappa Phi, Sigma Alpha Epsilon, Sigma Alpha Mu, Sigma Chi, Sigma Nu, Sigma Phi Epsilon, Sigma Pi, Tau Kappa Epsilon, Theta Chi, and Theta Tau.

State has eight national general college sororities. They are Alpha Delta Pi, Alpha Kappa Alpha, Chi Omega, Delta Sigma Theta, Sigma Gamma Rho, Sigma Kappa, Zeta Phi Beta, and Zeta Tau Alpha.

Other Organizations. There are over 250 other student organizations, most of which are open to all interested students.

STUDENT MEDIA

North Carolina State students have the opportunity to edit and manage a variety of student-oriented media. By working with these media a student may gain valuable extra-curricular experience in journalism, broadcasting, production and design, leadership, and management.

There are four media supported in large part by a designated portion of each student's non-academic fees and staffed by students.

The **Agromeck**, the University yearbook, provides a record in words and pictures of student and campus activities during the past year.

The **Technician**, the student newspaper, is published three mornings a week.

The **Windhover**,the campus literary magazine, is published each spring.

WKNC (88.1-FM), the student radio station, operates at 3000 watts, enabling it to be heard within a 42-mile radius of Raleigh. The station operates 24 hours a day with a full staff of engineers, disc jockeys, and news personnel.

Several of the colleges have their own publications dealing with material of special interest to students in these areas. The publications include *Agri-Life*, Agriculture and Life Sciences; the *Pi-Ne-Tum*, Forest Resources; *The Southern Engineer*, Engineering; *The Textile Forum*, Textiles; *The Publications of the School of Design*; and *The Scientist*, Physical and Mathematical Sciences.

MUSICAL ORGANIZATIONS

Since the early days of North Carolina State, musical organizations have played an important part in campus life presenting concerts, furnishing music for official university functions and performing at athletic events. The combined membership of these organizations constitutes the largest voluntary student organization on campus. Students may join the bands, choral organizations, orchestras, and pipes and drums by reporting for an audition at the time and location indicated in the orientation schedule. Rehearsals are arranged to avoid conflicts with other classes or with study time. Membership in all musical organizations is open to any regularly enrolled student.

Bands. The Symphonic Band, the Fanfare Band, the British Brass Band and the Marching Band make up the four divisions of the N. C. State bands. Each band serves a specific purpose and assignments are made according to individual interests and abilities. The Symphonic, Fanfare and Brass Bands are concert organizations. The Marching Band is active only during football season.

Choral Groups. The Varsity Men's Glee Club, the University Choir, the Chamber Music Singers and the New Horizons Choir make up the four choral divisions. Placement in an organization is made according to the student's abilities and interest. These groups present concerts each year, both on and off campus, as well as making radio and television appearances, recordings, tours and providing small ensembles for special occasions.

Orchestras. Members of the Raleigh Civic Symphony and the University-Civic Concert Orchestra include NCSU students and faculty, students and faculty from area colleges and universities, and community members. Placement is made according to individual ability and interest. A wide range of orchestral music is read and performed, with concerts given on and off campus. Provisions

are made for those with an interest in string quartet and other small ensemble experience. An Intermediate String Class is available for those who desire to improve their technical skills and who seek further playing experience before performing with one of the orchestras.

NCS Pipes and Drums. Students may learn to play the bagpipes, an instrument known to many of North Carolina's early settlers, and represent the university through this unique and distinctive medium. The NCS Pipes and Drums performs several times throughout the year at University and community functions. Pipes, drums, and equipment are furnished.

Artist-in-Residence. North Carolina State University established this special chair in the Music Department to facilitate the university's cultural development. Performing musicians are appointed to this position on a rotating basis. They are available to all university classes and organizations for concerts and presentations.

UNIVERSITY STUDENT CENTER

The University Student Center provides a focal point for much of the extracurricular life on campus featuring lounge areas, vending areas, a game room, dining facilities, meeting rooms and much more.

The majority of the activity in the student center focus on the arts. Stewart Theatre presents an extensive professional performing arts season of music, dance, theatre, comedy and more during the Center Stage season. Students may attend performances by some of the world's greatest actors at reduced rates. Lectures, films, debates and other special events are also held in the 816-seat facility.

The Visual Arts Programs Office maintains the University's permanent art collection. Many exhibitions and special educational programs are presented in the center each year.

The University Student Center is guided by the student officers of the Union Activities Board, committee chairmen and a student-faculty board of directors. Student committees are involved in all of the arts areas in addition to committees on lectures, films, game tournaments, black cultural programs, international student programs, coffee houses, dances and more.

The center also houses the student newspaper offices, the yearbook office, radio station, Student Government offices, the International Student Office, the Inter-Fraternity Council office, and space for religious workers, volunteer services, and the Student Leadership Center.

Other cultural programs and opportunities provided by branches of the Student Center include: Thompson Theatre, where students participate in acting, producing, and writing their own theatre productions; Price Music Center, where students participate in a wide range of choral and instrumental groups; and the Craft Center, where students receive instruction in a broad range of crafts.

THOMPSON THEATRE

Thompson Theatre is a student oriented theatre with an emphasis on flexibility and experimentation. Each production is open to all NCSU students, whether experienced or not, as actors, technicians, crew members and directors.

Major productions are directed and produced by the professional theatre staff. Experimental studio theatre productions are completely produced by students under the guidance and supervision of the professional staff. There are also black theatre and children's theatre productions.

Thompson Theatre works closely with the Department of Communication which offers several courses for those interested in theatre.

The University Players is the student organization within the theatre which recommends theatre operating policies and helps to determine the theatre's program.

STEWART THEATRE

Stewart Theatre, located in the University Student Center, offers an opportunity for students and other members of the university community to see and hear the best in professional performances: plays, jazz, pops, folk and chamber music concerts, both modern dance and ballet, films and lectures. Special rates are available to NCSU students.

CRAFTS CENTER

Located on the ground floor of the Thompson building is one of the finest crafts facilities on any southeastern university campus. Instruction is offered in ceramics, woodworking, photography, textile design, weaving and a host of other crafts. The facilities are also available for independent work. The Crafts Center is open year-round. Supplies for most crafts can be purchased at the center.

LEADERSHIP TRAINING

The **Student Leadership Center**, sponsored by the University Student Center, offers a variety of programs such as the Leadership Development Series and the Role Model Leader's Forum that are designed to give all NCSU students the opportunity to explore the nature of leadership and to develop their own leadership potential and skills in living. The Leadership Development Series consists of approximately 50 non-credit three-hour modules that focus on different aspects of leadership. These modules are normally offered on Monday and Tuesday evenings and at least once each semester. Further information may be obtained from 3111 University Student Center (737-2452).

A **Leader's Reaction Course** is maintained and operated by the Military Science Department. This course is designed to provide practical experience in problem-solving, decision-making, and directing the activities of small groups. The course is available to all student organizations and activities officially recognized by the university. Its use must be coordinated through the Professor of Military Science.

The **Pershing Rifles** is a student organization open to all students at North Carolina State University. Members of the Pershing Rifles participate in drill and ceremony activities to include the colorguard at home football and basketball games. Additionally, they participate in parades in the local area and regional drill meets. The Pershing Rifles is sponsored by the Army ROTC, though participants are not required to be enrolled in the ROTC program.

The **Ranger Challenge Team** is a cadet organization open to members of the Wolfpack Battalion. Members of the Ranger Challenge Team participate in many physically and mentally demanding activities throughout the school year, including tactical exercises, rope bridging, road marching, land navigation, helicopter flights, and competitions. The Ranger Challenge Team is sponsored by Army ROTC.

INTERCOLLEGIATE ATHLETICS

The Department of Athletics conducts the university's intercollegiate athletics program involving 12 varsity sports for men, and 10 for women and one co-ed.

The athletics program is administered by the Athletics Director with the Athletics Council, made up of eleven faculty, three alumni, two members of student government, two student athletes, and one coach, serving in an advisory capacity to the Athletics Director and Chancellor. The program is self-supporting and is operated through gate receipts, radio and television revenues, and student fees. Funds for athletics grants-in-aid are provided through the North Carolina State Student Aid Association (Wolfpack Club). Grants-in-aid are based upon the recommendation of the coach of each sport and approved by the Athletics Director and awarded by the university's Financial Aid Office.

Men's varsity sports include soccer, cross country, and football in the fall; basketball, swimming, fencing, indoor track, and wrestling in the winter; and track, golf, tennis, and baseball in the spring. Varsity sports for women are soccer, cross country, and volleyball in the fall; basketball, indoor track, swimming, fencing, and gymnastics in the winter; and track, and tennis in the spring. During the winter the co-ed rifle team competes.

The university facilities include Carter-Finley Stadium (45,600 seats); Reynolds Coliseum (12,000 seats for basketball); Doak Field (3,800 seats for baseball); the Paul H. Derr Track Stadium (3,000 seats), with a nine-lane tartan track; a 2,200 seat swimming stadium, with a 25-yard by 25-meter pool and a 50-meter training and competition pool; a soccer field (5,000 seats); and a 12-court all-weather tennis complex. In addition, the Wolfpack athletics administrative offices, women's intercollegiate coaches offices, several men's sports coaches offices, and an athletics dining hall are housed in the Case Athletics Center. The Weisiger-Brown General Athletics Facility houses the football, track and wrestling coaches' offices, a weight room, a wrestling room, a training room, an equipment room, and dressing rooms for football, wrestling, and track. Reynolds Coliseum has a weight room, training room, and locker and dressing facilities for the women's sports and dressing rooms for the men's sports of basketball, baseball, soccer, and tennis.

INTRAMURAL-RECREATIONAL SPORTS

North Carolina State University maintains an extensive program of intramural-recreational sports administered by the Department of Physical Education. This program is divided into the areas of intramural sports, club sports, informal recreation, extramural sports, and special events. The intramural sports program is available to all students, faculty, and staff.

Twenty-three individual and team sports are offered and participants may join through different divisions; i.e., residence, sororities, fraternities, open and co-recreational. The sports available are: Badminton, Basketball (2-Player, 3-Player, 5-Player, Dixie Classic, and Faculty), Bowling, Cross Country, Flag Football, Golf, Handball, Pitch & Putt, Racquetball, Soccer, Softball, Squash, Swimming, Table Tennis, Tennis, Track & Field, Tri-Challenge Football, and Volleyball.

Club sports programs are available to those interested in specialized activities that provide opportunities for instructional experiences, a higher level of competition, or recreational and social benefits. At present, the active clubs recognized are: Aerobics, Archery, Badminton, Baseball, Bowling, Country & Western Dance, Cycling, Frisbee, Ice Hockey, Judo, Lacrosse (Men), Lacrosse (Women), Outing, Racquetball, Rowing, Rodeo, Rugby, Sailing, Snow Ski, Soccer (Men), Soccer (Women), Sports Officials, Squash, Tae Kwon Do, Tennis, Volleyball, Water Aerobics, Water Polo, Water Ski, Wind Surfing, and Wrestling.

"Big Four Sports Day" is an extramural event for men and women representing North Carolina State, UNC-Chapel Hill, Duke, and Wake Forest. The competition includes the sports of badminton, basketball, bowling, cross country, golf, racquetball, softball, swimming, table tennis, tennis, and volleyball.

The Intramural-Recreational Sports Program is comprehensive in scope and committed to meeting the sports and physical activity needs of the students, faculty, and staff at North Carolina State University.

COLLEGES, DEPARTMENTS, AND PROGRAMS OF STUDY

Undergraduate programs of study are offered by the College of Agriculture and Life Sciences, the School of Design, the College of Education and Psychology, the College of Engineering, the College of Forest Resources, the College of Humanities and Social Sciences, the College of Physical and Mathematical Sciences, and the College of Textiles.

GENERAL EDUCATION DISTRIBUTION REQUIREMENTS

A university education should prepare students for a full life in their professions and occupations by means of curricula that provide both practical foundations for future careers and such intangibles as intellectual flexibility, broad knowledge, and a basic comprehension of human achievements. To accomplish these ends, all baccalaureate programs at NCSU include the following general education requirements:

English Composition—Satisfactory completion of ENG 111 and ENG 112.

Mathematics—Six credit hours of mathematics and/or work in the closely related fields of statistics, computer science, and logic. At least one of these courses must be a course in mathematics.

Humanities and Social Sciences—Eighteen credit hours not including ENG 111 and ENG 112. Within the minimum of eighteen credit hours, at least six credit hours must be in the humanities and at least six credit hours must be in the social sciences. A list of courses appropriate for use as humanities courses and a list of courses appropriate for use as social science courses are issued periodically by the Provost's Office. Courses not on the list may not be used to fulfill humanities or social science requirements in any curriculum. Colleges and departments may specify groups of courses or specific individual courses from the list to be used by their students in fulfilling the humanities and social science requirements in their curricula.

Natural Sciences—Eight credit hours, including at least one basic course from the biological, earth, or physical sciences.

Free Electives—All curricula must include at least nine credit hours of free electives. No other limitations should be imposed upon the student's choice of these electives, provided the student has satisfied the prerequisites and provided that no elected course should cover material that is considered remedial, that covers material at an elementary level after the student has taken comparable material at an advanced level, or that covers material substantially presented in a course previously taken. Students are encouraged to use their free electives to explore fields of study different from those required in their curriculum. Free electives may be taken on a credit-only basis up to a maximum of 12 credit hours. Types of courses that are frequently selected as free electives include environmental awareness courses, fine arts, introductions to a discipline or technology designed for non-majors, additional humanities and

social sciences, and courses that are part of a minor, a second major, or a dual degree. Any elective in a curriculum is interpreted as a free elective unless qualifications are specifically listed.

Physical Education—Four credit hours of physical education (PE 100 and three credit hours of activity courses). Required physical education courses may be taken on a credit-only basis. Students with appropriate skills, experience, and knowledge may satisfy three of the four required physical education credits (PE 100 not included) through credit by examination. All students who do not pass the survival swimming test taken during PE 100 will be expected to take PE 112 (Beginning Swimming) unless exempted.

The full requirements for completion of each undergraduate program of study at NCSU reflect the general education distribution requirements described above, additional college requirements, and departmental requirements particular to a given major or degree program. Throughout this section the degree requirements are frequently shown as particular courses or categories of courses. The **course prefix abbreviations** (e.g., ANS, CSC, HI, and PSY) provide a key for locating the basic information for individual courses in the Course Description section of this catalog.

GRADUATION REQUIREMENTS

Students are eligible for graduation when they have completed satisfactorily all the academic requirements of their degree program as specified by their major department, their college, and the university.

NCSU requires that, in addition to other university, college, and departmental requirements, all students must have a grade point average of at least 2.0, based on all courses attempted at NCSU, in order to be eligible to receive a baccalaureate degree.

Minimum Hours Required for Graduation—These are shown for each curriculum and range from 124 to 141. Curricula in the high range normally are those involving a required summer camp or field experience. Many students take more hours than the required minimum.

Length of Time to Graduation—Many factors influence the length of time that it takes students to graduate. Undergraduate students frequently take more than eight semesters to complete an undergraduate program at NCSU and at most universities in the United States. This usually occurs as a result of one or more of the following factors: (1) part-time enrollment, (2) reduced class loads for health, part-time employment, or other reasons, (3) one or more changes of curriculum, (4) participation in cooperative education programs, (5) participation in study abroad programs, (6) incomplete or inadequate secondary school background requiring some additional compensatory, developmental, or prerequisite courses, or (7) poor academic performance in the freshman year or early semesters. Some factors that may accelerate progress towards graduation include (1) advanced placement for introductory courses, (2) enrollment in summer sessions, and (3) good academic performance in freshman and basic prerequisite courses.

The University discourages students from taking heavy and unrealistic course loads as a means to accelerate their progress towards graduation since this may

result in poor academic performance. Some colleges and schools have established maximum course load limitations for first-semester or first-year students depending upon their academic performance projections.

Semester-by-Semester Displays—The requirements for many curricula throughout this section are set forth in semester-by-semester displays. One purpose for these displays is to illustrate how certain sequences of courses and prerequisites may be scheduled. Another purpose is to reflect whether courses are normally offered in the fall or the spring semester. Otherwise, the semester-by-semester displays are merely advisory and not mandatory. The typical semester schedule shown in the displays may not be the appropriate one for many students. Students are required to consult with their faculty advisers prior to registration each semester.

Limited D Grades—Some colleges and departments have established limitations on the use of D grades in certain courses or categories of courses for satisfying graduation requirements.

Grade Point Average in Major—Some departments have established graduation requirements of a grade point average of 2.0 on all courses attempted in the major at NCSU in addition to the university grade point average requirement of a 2.0 for all courses attempted at NCSU. These include the following departments: Chemistry; Economics and Business; History; Sociology, Anthropology and Social Work; and all departments in the College of Engineering.

Residence Requirements—To be eligible for a bachelor's degree, a student must be enrolled in a degree program and must have earned at least 30 of his or her last 45 hours of credit through NCSU courses. Individual departments and/or colleges may have additional residence requirements.

NOTE: *The College of Engineering has a policy that transfer students normally must earn at least 48 of their last 60 hours of credit at NCSU while enrolled as degree candidates.*

MINORS

Some departments at NCSU offer undergraduate minors for students wishing a systematic program of study in an area outside their major. All minors require at least 15 credit hours and may be either departmental or interdepartmental. Courses within the minor program may be used to satisfy any of the general requirements, including free electives, of a major curriculum. Minors are completely optional, the only requirement being that a student may not minor in the same discipline as their major. Students pursuing a minor must consult with a minor advisor on a plan of work and must file a copy of this plan with their major advisor at least one semester before graduation. Satisfactory completion of the minor will be noted on the final transcript following graduation.

TWO DEGREES

Students who have satisfactorily completed the requirements for more than one bachelor's degree may, upon the recommendation of their deans, be awarded two bachelor's degrees at the same or at different commencement exercises. To earn two degrees students register in one school or department and, with the

cooperation of the second school or department, work out their program to cover the requirements for both. Students must file an approved Double Majors Only Curriculum Change Form with Registration and Records, 1000 Harris Hall. An Application for Degree Form must be submitted for each degree.

TRANSCRIPTS OF ACADEMIC RECORD

A transcript is an exact copy of a student's permanent academic record at the time it is issued. A fee of two dollars is charged for each transcript.

No official transcript may be issued to or for a student who is indebted to the university until such indebtedness has been paid or satisfactorily adjusted.

Official transcripts are issued only upon the *written* request of the student to Registration and Records, Box 7313, Raleigh, N.C. 27695-7313.

COLLEGE OF AGRICULTURE AND LIFE SCIENCES

Patterson Hall (Room 115)

D. F. Bateman, *Dean*

J. L. Oblinger, *Associate Dean and Director of Academic Affairs*

J. F. Ort, *Assistant Director of Academic Affairs and Director of Agricultural Institute*

W. C. Grant, *Assistant Director of Academic Affairs*

M. W. Moore, *Academic and Career Advisor*

The academic programs in the college represent a unique blending of the agricultural and life sciences. Agriculture is a very diverse industry that touches everyone's life in some way or another. The continuum is founded on the principles of science, technology, and business. The life sciences provide foundations for studying medical and health-related disciplines as v ell as environmental sciences and molecular biology.

The overall goals of the instructional program in the College of Agriculture and Life Sciences include providing relevant, scientific, and practical knowledge of the food, agricultural, and life sciences to its students. These programs emanate from a highly qualified and accomplished faculty committed to academic excellence and the development of the individual to his or her personal and professional potential. Central to the college's goals is the cultivation of interdisciplinary problem-solving skills which will serve its graduates well as they pursue a lifetime of learning and adaptation to change.

The objectives of the academic program are as follows:

1) To provide an opportunity for a broad university education
2) To provide a variety of learning experiences
3) To offer a choice of specialization in agriculture and life sciences
4) To provide background for graduate or professional programs

STUDENT ACTIVITIES

Students in the College of Agriculture and Life Sciences have ample opportunities to take part in broadening extracurricular activities. Most departments have student organizations that provide professional as well as social experience. Representatives of these clubs form the Agri-Life Council. This council is the student organization representing the college. Student tours provide an opportunity to see firsthand the application of classroom principles. In addition, students representing agrimarketing, agronomy, animal science, horticultural science, food science, poultry science and soil science compete regionally and nationally in a number of activities providing student members a chance to learn by travel as well as by participation.

CURRICULUM OFFERINGS AND REQUIREMENTS

A freshman enrolling in Agriculture and Life Sciences has common core courses the first year—courses appropriate in all curricula. This approach allows the student time to explore various programs before selecting a curriculum. The student selects a major in a department, interdisciplinary program, or individualized course plan. All departments offer *science* curricula (intended primarily for students who anticipate attending graduate or professional school); several *technology* curricula; and the Agricultural Business Management curriculum is offered in the Department of Agricultural and Resource Economics.

Departmental majors are offered as follows:

Science—agricultural economics, animal science, applied sociology, biochemistry, biological and agricultural engineering (joint program with the College of Engineering), botany, fisheries and wildlife sciences (joint program with College of Forest Resources), food science, horticultural science, medical technology, microbiology, poultry science, and zoology. Preprofessional courses are offered in the science curriculum track.

Technology—agricultural systems technology, animal science, food science, horticultural science and poultry science.

Business—agricultural business management is offered through the Department of Agricultural and Resource Economics. A concentration in biological sciences and the opportunity for double majoring in business and other programs are available.

Interdepartmental and Interdisciplinary Programs—These curricula offer the opportunity to select broad curriculum majors that involve two or more departments or colleges:

Agronomy—A technical curriculum dealing with the fundamentals of crop production and soil management. The curriculum is administered by the Departments of Crop Science and Soil Science.

Biological Sciences—A curriculum with emphasis on biological and physical sciences, especially designed for graduate or professional courses requiring a biology background.

Conservation—A curriculum concentrating on the use, management and improvement of natural resources. The curriculum is administered jointly by the College of Agriculture and Life Sciences and the College of Forest Resources.

Individualized Study Program—A curriculum planned by the student with the assistance of a faculty advisory committee.

In addition to these cited curricula, a number of arrangements are available that provide the student an opportunity to select areas of course concentration.

ACADEMIC MINORS

Several departments in the College of Agriculture and Life Sciences offer a minor in their discipline. Students interested in additional information regarding a minor should contact the appropriate departmental office. At present, the following minors are available:

Agricultural Business Management
Agricultural Economics
Animal Science
Applied Sociology
Botany
Food Science
Genetics
Horticultural Science
Nutrition
Soil Science
Zoology

HONORS PROGRAM

The College of Agriculture and Life Sciences has a comprehensive honors program for qualified students throughout their academic career. Both seminar discussion programs covering broad topics and an independent research program are included. Faculty provide direction on an individual basis to each student with the student selecting his or her project.

Participation in CALS Honors Program is limited to CALS students with a GPA of 3.25 or above. The following ALS courses, 299H, 498H, 499H, are required. In addition, a student must take at least six hours of honors coursework (at least 3 credits outside CALS) or participate in the University Scholars Program for at least two semesters. Honors coursework must be completed with a "C" or better.

HONOR SOCIETIES

Students in all majors with strong academic records are recognized by national organizations that have local chapters, Gamma Sigma Delta, Alpha Zeta, Alpha Epsilon Delta and Phi Kappa Phi.

SCHOLARSHIP PROGRAM

The College of Agriculture and Life Sciences awards approximately 250 scholarships each year on a combination of selection factors including merit, financial need and leadership.

JEFFERSON SCHOLARS IN AGRICULTURE AND THE HUMANITIES

(See also College of Humanities and Social Sciences)

The Thomas Jefferson Scholars Program in Agriculture and the Humanities is a joint program of the College of Humanities and Social Sciences and the College of Agriculture and Life Sciences. It is a double degree program which permits participants to have two concentrations: one in an area of agriculture, such as agronomy, animal science, food science, or horticulture, and one in an area of humanities/social sciences, such as business management, public policy, international studies or general humanities. The double degree program may be individually designed to meet each student's particular interests and career goals. The purpose of the program is to produce potential leaders in agriculture who have not only technical expertise but also an appreciation for the social, political, and cultural issues that effect decision-making.

Each spring a number of entering freshmen are chosen to receive scholarships to participate in the Jefferson program. In addition, other qualified students may choose to pursue a double major in agriculture and the humanities under the Jefferson program.

Students interested in applying to the Jefferson Scholars program should contact: Office of the Dean, College of Humanities and Social Sciences, Box 8101, North Carolina State University, Raleigh, NC 27695-8101, or the Office of the Associate Dean, College of Agriculture and Life Sciences, Box 7642, before January 15.

For more information, contact the program coordinator, Martha W. Moore, (111 Patterson Hall, 737-3249) or Lynda Hambourger, Assistant to the Dean, Humanities and Social Sciences (106 Caldwell Hall, 737-2467).

INTERNATIONAL STUDIES

An international seminar is offered to interested students. In addition, an international option, requiring a modern foreign language and 12 semester hours of appropriate courses in the social sciences, is available for students enrolled in any curricula.

DEGREES

The Bachelor of Science degree is conferred upon the satisfactory completion of one of the curricula in this college.

The degrees of Master of Science, Master of Agriculture and Master of Life Sciences are offered in the various departments in the college.

The Doctor of Philosophy degree is offered in the following subject areas: animal science, biochemistry, biological and agricultural engineering, botany, crop science, economics, entomology, food science, genetics, horticultural science, marine sciences, microbiology, nutrition, physiology, plant pathology, sociology, soil science, toxicology, and zoology.

Further information on graduate offerings may be found in the Graduate Catalog.

CAREER OPPORTUNITIES

A diversity of careers are available in agriculture and the life sciences. Areas pursued by graduates includes:

Professional and Graduate Education—The college provides premedical programs at the undergraduate level for medical, dental, optometry and veterinary medicine; graduate education.

Research—Medical; biological; agricultural environmental; engineering; processing; economics; marketing.

Agricultural/Horticultural Production—Livestock; poultry; aquaculture; fruits; vegetables; ornamentals; turfgrass.

Business and Industry—Banking; real estate/farm appraising; technical sales; farm management; marketing; retail management; manufacturing; processing.

Environmental/Conservation—Soil, water, forest, fish and wildlife, and education.

Education/Government—High school and college instruction in agriculture and life sciences; extension.

Services—Inspection and regulation; environmental testing; product grading; consulting.

The college has a Career Development and Placement Office, located in 111 Patterson Hall.

FRESHMAN YEAR

The curricula in the College of Agriculture and Life Sciences have a common freshman year with the exception of the science program in biological and agricultural engineering. For the freshman year of that curriculum, see the College of Engineering.

Fall Semester			*Credits*
ALS	103	Introductory Topics in ALS	1
BS	100	General Biology *or*	
CH	101	General Chemistry I[1]	4
ENG	111	Composition & Rhetoric	3
MA	111	Precalculus[2] Algebra & Trig.	3
PE	100	Health & Physical Fitness	1
Humanities/Soc. Sci. Elective			3
(Military Science or Air Science may be elected)			
			15

Spring Semester			*Credits*
BS	100	General Biology *or*	
CH	101	General Chemistry I *or*	
CH	107	Principles of Chemistry	4
ENG	112	Composition & Reading	3
MA	114	Intro. to Finite Math. with Appl. *or*	
MA	131	Analytic Geometry & Calc. A	3-4
Humanities/Soc. Sci. Elective			3
Physical Education			1
(Military Science or Air Science may be elected)			
			14-15

[1]Both biology and chemistry are required for all ALS curricula.
[2]Does not contribute to the 130 semester hours required in certain curricula. Consult departmental faculty adviser.

CURRICULA IN AGRICULTURE AND LIFE SCIENCES

Science, technology and business are three curricula offered in this college. All departments offer the science curriculum. Several departments offer the choice of either science or technology. In addition, several departments are participating in interdisciplinary programs.

An agricultural business management curriculum is offered by the Department of Agriculture and Resource Economics. Double majors between agricultural business management and other subject areas may be arranged.

All the curricula have a core of required courses on a college basis. Courses peculiar to a specific department are listed under the departmental requirements. Listed on the following pages are the required courses by curriculum on a college basis. *All curricula require the completion of one course in literature.*

SCIENCE

			Credits
ALS	103	Introductory Topics in ALS	1
Language (12 Credits)			
ENG	111	Composition and Rhetoric	3
ENG	112	Composition and Reading	3
Electives (English, Communication or Modern Language)			6
Humanities and Social Sciences (21 Credits)			
Electives from Group D			21

Physical and Biological Sciences (27-31 Credits)			
BS	100	General Biology	4
CH	101	General Chemistry I	4
CH	103	General Chemistry II *or*	
CH	107	Principles of Chemistry	4
MA	111	Precalc. Algebra & Trig.	3
MA	114	Intro. to Finite Math. with Appl. *or*	
MA	131	Analytic Geometry & Calc A	3-4
PY	211,	PY 212 College Physics I, II *or*	
PY	221	College Physics	5-8
Biological Sciences Elective			4

Electives (65-69 Credits)

Departmental Requirements & Electives	26
Restricted Electives from Group A	22-26
Free Electives	13
Physical Education	4
Minimum Hours Required for Graduation	130

BUSINESS

(See Department of Agricultural and Resource Economics under College of Agriculture and Life Sciences)

TECHNOLOGY

		Credits
ALS 103	Introductory Topics in ALS	1

Language (12 Credits)

ENG 111	Composition and Rhetoric	3
ENG 112	Composition and Reading	3
English Elective (Requirement may be satisfied by a modern language)		3
COM (SP) 110	Public Speaking	3

Humanities and Social Sciences (21 Credits)

Electives from Group D	21

Physical and Biological Sciences (31-32 Credits)

BS 100	General Biology	4
CH 101	General Chemistry I	4
CH 103	General Chemistry II *or*	
CH 107	Principles of Chemistry	4
MA 111	Precalc. Algebra & Trig.	3
MA 114	Intro. to Finite Math. with Appl.	4-3
MA 131	Analytic Geometry & Calc. A *or*	
PY 221	College Physics	5
SSC 200	Soil Science	4
Biological Sciences Elective		4

Electives (64-65 Credits)

Departmental Requirements & Electives	27
Restricted Electives from Groups A, B or C	20-21
Free Electives	13
Physical Education	4
Minimum Hours Required for Graduation	130

A B C D ELECTIVES

The following lists provide typical courses that may be selected from each of the four groups. Group A includes the physical and biological sciences; Group B, economics and business; Group C, applied science and technology; and Group D, social sciences and humanities. Other appropriate courses may be selected by checking with the office of the Director of Academic Affairs.

Group A
PHYSICAL AND BIOLOGICAL SCIENCES

Animal Science

ANS 330 Reproductive Physiology
ANS 405 Lactation
ANS (NTR, PO) 415 Comparative Nutrition
ANS (NTR) 419 Human Nutrition in Health and Disease
ANS (PHY) 502 Reproductive Physiology of Vertebrates
ANS (GN) 508 Genetics of Animal Improvement
ANS (NTR) 516 A,B,C,D Animal Nutrition Research Methods

Biochemistry

BCH 150 Introductory Biochemical Concepts
BCH 451 Introductory Biochemistry
BCH 452 Introductory Biochemistry Laboratory
BCH 453 Introduction to Molecular Biology and Metabolism
BCH 552 Experimental Biochemistry
BCH (GN) 561 Biochemical and Microbial Genetics

Biological and Agricultural Engineering

BAE 303 Energy Conversion in Biological Systems

Biological Sciences

All courses listed with the BS designation.

Biomathematics†

Appropriate courses

Botany

BO 200 Plant Life
BO 213 Plants and Civilization
BO (ZO) 360 Introduction to Ecology
BO (ZO) 365 Ecology Laboratory
BO 400 Plant Diversity
BO 403 Systematic Botany
BO 413 Introductory Plant Anatomy
BO (ZO) 414 Cell Biology
BO 421 Plant Physiology
BO 510 Plant Anatomy

BO 522 Adv. Morphology and Phylogeny of Seed Plants
BO 524 Grasses, Sedges and Rushes
BO 565 Plant Community Ecology

Chemistry†

Appropriate Courses

Computer Science†

Appropriate Courses

Entomology

ENT 301 Introduction to Forest Insects
ENT 312 Introduction to Economic Entomology
ENT (ZO) 425 General Entomology
ENT 502 Insect Diversity
ENT 503 Functional Systems of Insects

Fisheries-Wildlife

FW (FOR) 404 Forest Wildlife Management
FW (ZO) 420 Fishery Science
FW (ZO) 515 Fish Physiology

Food Science

FS 331 Food Engineering
FS 402 Food Chemistry
FS 403 Food Analysis
FS (MB) 405 Food Microbiology
FS 504 Food Proteins and Enzymes
FS (MB) 506 Advanced Food Microbiology

Forestry

FOR (WPS) 273 Quantitative Methods in Forest Resources
FOR (MEA, PM) 386 Agricultural and Forest Meteorology
FOR (FW) 404 Forest Wildlife Management

Genetics

GN 411 Principles of Genetics
GN 412 Elementary Genetics Laboratory
GN 504 Human Genetics
GN (ANS) 508 Genetics of Animal Improvement
GN (ZO) 540 Evolution
GN (BCH) 561 Biochemical and Microbial Genetics

Marine, Earth and Atmospheric Sciences†

Appropriate courses.

Mathematics†

Appropriate Courses

Microbiology

MB 200 Microbiology and World Affairs
MB 401 General Microbiology
MB (FS) 405 Food Microbiology
MB 411 Medical Microbiology
MB 501 Advanced Microbiology I
MB 502 Advanced Microbiology II
MB (FS) 506 Advanced Food Microbiology
MB 514 Microbial Metabolic Regulation
MB (SSC) 532 Soil Microbiology
MB 551 Immunology I

Nutrition

NTR (ANS, PO) 415 Comparative Nutrition
NTR (ANS) 419 Human Nutrition in Health and Disease
NTR (ANS) 516 A,B,C,D Animal Nutrition Research Methods

Physics†

Appropriate Courses

Physiology

PHY (ANS) 502 Reproductive Physiology of Vertebrates
PHY (ZO) 503 General Physiology I
PHY (ZO) 504 General Physiology II
PHY (ZO) 513 Comparative Physiology

Plant Pathology

PP 501 Phytopathology I
PP 502 Phytopatholgy II

Poultry Science

PO 405 Avian Physiology
PO (ANS, NTR) 415 Comparative Nutrition
PO (ZO) 524 Comparative Endocrinology

Soil Science†

SSC 200 Soil Science
SSC 511 Soil Physics
SSC 520 Soil and Plant Analysis
SSC 522 Soil Chemistry
SSC (MB) 532 Soil Microbiology

Statistics†

Appropriate Courses

Zoology

ZO 201 General Zoology
ZO 205 Introduction to Cellular and Departmental Zoology
ZO 208 Introduction to Organismal and Evolutionary Zoology
ZO 212 Basic Anatomy and Physiology
ZO (MEA) 220 Marine Biology
ZO 303 Vertebrate Zoology
ZO 305 Cellular and Animal Physiology Laboratory
ZO 315 General Parasitology
ZO 323 Comparative Anatomy
ZO 345 Histology
ZO (BO) 360 Introduction to Ecology
ZO 361 Principles of Embryonic Development
ZO (BO) 365 Ecology Laboratory
ZO 402 Invertebrate Zoology
ZO 403 Invertebrate Zoology Laboratory
ZO 410 Intro. to Animal Behavior
ZO (BO) 414 Cell Biology
ZO (FW) 420 Fishery Science
ZO 421 Principles of Physiology
ZO 422 Biological Clocks
ZO (ENT) 425 General Entomology
ZO 441 Biology of Fishes
ZO 442 Biology of Fishes Laboratory
ZO 450 Evolutionary Biology
ZO 460 Aquatic Natural History Laboratory
ZO 480 Laboratory Techniques in Cellular Biology
ZO (PHY) 503 General Physiology I
ZO (PHY) 504 General Physiology II
ZO (PHY) 513 Comparative Physiology
ZO (FW) 515 Fish Physiology
ZO 517 Population Ecology
ZO (PO) 524 Comparative Endocrinology
ZO (GN) 540 Evolution

†Courses in these blocks are considered Physical Sciences.

Group B

ECONOMICS AND BUSINESS

Accounting

ACC 210 Accounting I—Concepts of Financial Reporting
ACC 220 Accounting II—Introduction to Managerial Accounting
ACC 280 Managerial Accounting
ACC 310 Intermediate Financial Accounting I
ACC 311 Intermediate Financial Accounting II
ACC 320 Managerial Uses of Cost Data
ACC 330 An Introduction to Income Taxation
ACC 340 Accounting Information Systems
ACC 410 Advanced Financial Accounting
ACC 420 Production Cost Analysis and Control
ACC 430 Advanced Income Tax
ACC 450 Auditing Financial Information
ACC 460 Specialized Financial Reporting Theory and Practice

Economics and Business

EB 303 Farm Management
EB 306 Agricultural Law
EB 307 Business Law I
EB 308 Business Law II
EB 311 Agricultural Markets
EB 313 Marketing Methods
EB 320 Financial Management
EB 325 Managerial Economics
EB 326 Human Resource Management
EB 332 Industrial Relations
EB 346 International Business
EB (ST) 350 Economics and Business Statistics
EB 405 Regulatory Law
EB 415 Farm Appraisal and Finance
EB 420 Financial Management of Corporations
EB 422 Investments and Portfolio Management
EB 425 Quantitative Methods of Management
EB 451 Introduction to Econometrics
EB 460 Marketing Research
EB 465 Advertising and Promotion Management
EB (TAM) 482 Textile Marketing Management
EB (WPS) 485 Management Development Seminar

Mathematics

MA 122 Mathematics of Finance

Statistics

ST (EB) 350 Economics and Business Statistics

Group C

APPLIED SCIENCE AND TECHNOLOGY

Agricultural Communications

AC 311 Communication Methods and Media
AC 470 Agricultural Communications
AC (FW) 485 Natural Resource Advocacy

Animal Science

ANS 100 Perspectives in Animal Science
ANS 200 Introduction to Animal Science
ANS 201 Techniques of Animal Care
ANS 202 Techniques of Horse Care
ANS (PO) 204 Feeds and Feeding
ANS 210 Microcomputers in Animal Production
ANS 300 Animal Production Field Study Trip
ANS (FS, NTR) 301 Modern Nutrition
ANS 302 Livestock and Dairy Evaluation
ANS 303 Principles of Equine Evaluation
ANS 308 Advanced Livestock Judging
ANS 310 Basic Horse Husbandry
ANS 311 Livestock Breeding and Improvement
ANS (FS,PO) 322 Muscle Foods and Eggs
ANS (FS) 324 Milk and Dairy Products
ANS 402 Beef Cattle Management
ANS 403 Swine Management
ANS 404 Dairy Cattle Management
ANS 406 Sheep Management
ANS 410 Equine Management
ANS 412 Applied Animal Breeding
ANS 510 Advanced Livestock Management
ANS 520 Tropical Livestock Production

Biological and Agricultural Engineering

BAE 151 Elements of Biological and Agricultural Engineering I
BAE 201 Shop Processes and Management
BAE 211 Farm Machinery
BAE 221 Agricultural Systems I: Microcomputer Applications
BAE 222 Agricultural Systems II: Methodologies and Approaches
BAE 241 Computer Applications in Agriculture
BAE 252 Elements of Biological and Agricultural Engineering II
BAE 311 Agricultural Power and Machinery
BAE (SSC) 323 Water Management
BAE (SSC) 324 Elementary Surveying
BAE 331 Agricultural Systems III: Management Techniques
BAE 332 Farm Structures
BAE 333 Processing Agricultural Products
BAE 342 Agricultural Processing
BAE 343 Agricultural Electrification
BAE 344 Circuits and Controls
BAE 411 Farm Power and Machinery
BAE 433 Processing Agricultural Products
BAE 441 Agricultural Systems IV: Modelling and Analysis
BAE 442 Agricultural Systems V: Senior Project
BAE 471 Soil and Water Engineering
BAE 481 Agricultural Structures and Environment
BAE (CE) 578 Agricultural Waste Management

Botany

BO (CS, ENT, PM, PP) 525 Biological Control

Civil Engineering

CE (BAE) 578 Agricultural Waste Management

Crop Science

CS 211 Introduction to Crop Plant
CS 213 Crops: Adaptation and Production
CS 312 Pastures and Forage Crops
CS 316 Soybean Production
CS 317 Corn Production
CS 318 Corn and Soybean Production
CS 411 Environmental Aspects of Crop Production
CS 413 Plant Breeding
CS 414 Weed Science
CS 415 Agronomic Pest Management Systems
CS (SSC) 462 Soil-Crop Management Systems
CS 511 Tobacco Technology
CS 513 Physiological Aspects of Crop Production
CS (HS) 514 Principles and Methods in Weed Science
CS (BO, ENT, PM, PP) 525 Biological Control

Entomology

ENT 203 Introduction to the Honey Bee and Beekeeping
ENT (BO, CS, PM, PP) 525 Biological Control

ENT 550 Fundamentals of Insect Control
ENT 562 Insect Pest Management in Agricultural Crops
ENT (ZO) 582 Medical and Veterinary Entomology

Fisheries-Wildlife

FW (ZO) 221 Conservation of Natural Resources
FW (FOR) 310 Fisheries and Wildlife Inventory and Management
FW (ZO) 353 Wildlife Management
FW (ZO) 430 Fisheries-Wildlife Administration
FW (AC) 485 Natural Resource Advocacy

Food Science

FS 201 Food Science and the Consumer
FS (ANS, NTR) 301 Modern Nutrition
FS (ANS, PO) 322 Muscle Foods and Eggs
FS (ANS) 324 Milk and Dairy Products
FS 400 Principles of Human Nutrition
FS 416 Quality Control of Food Products
FS 421 Food Preservation
FS 423 Muscle Food Technology
FS 425 Processing Dairy Products
FS (HS) 462 Postharvest Physiology

Genetics

GN 301 Genetics in Human Affairs
GN (PO) 520 Poultry Breeding

Horticultural Science

HS 100 Home Horticulture
HS 101 Plants for Home and Pleasure
HS 201 Principles of Horticulture
HS 211 Ornamental Plants I
HS 212 Ornamental Plants II
HS 301 Plant Propagation
HS 342 Landscape Horticulture
HS 371 Interior Plantscapes
HS 400 Residential Landscaping
HS 411 Nursery Management
HS 416 Principles of Ornamental Planting Design
HS 421 Tree Fruit Production
HS 422 Small Fruit Production
HS 431 Vegetable Production
HS 440 Greenhouse Management
HS 441 Floriculture I
HS 442 Floriculture II
HS (FS) 462 Postharvest Physiology
HS 471 Tree and Ground Maintenance
HS (CS) 514 Principles and Methods in Weed Science
HS 531 Physiology of Landscape Plants

Nutrition

NTR (ANS, FS) 301 Modern Nutrition

Pest Management

PM 111 Introduction to Integrated Pest Management
PM (SSC) 370 Alternative Agricultural Systems
PM (FOR, MEA) 386 Agricultural and Forest Meteorology
PM 405 Theory and Practice of Integrated Pest Management
PM (BO, CS, ENT, PP) 525 Biological Control

Plant Pathology

PP 315 Principles of Plant Pathology
PP (FOR) 318 Forest Pathology
PP 415 Plant Disease Control
PP 505 Histopathology
PP (BO, CS, ENT, PM) 525 Biological Control

Poultry Science

PO 201 Poultry Science and Production
PO (ANS) 204 Feeds and Feeding
PO 301 Evaluation of Live Poultry
PO (ANS, FS,) 322 Muscle Foods and Eggs
PO 351 Grading and Evaluation of Poultry Products
PO 410 Production and Management of Game Birds in Confinement
PO 420 Turkey Production
PO 421 Commercial Egg Production
PO 422 Incubation and Hatchery Management
PO 423 Broiler Production
PO (GN) 520 Poultry Breeding

Soil Science

SSC (BAE) 323 Water Management
SSC (BAE) 324 Elementary Surveying
SSC 341 Soil Fertility and Fertilizers
SSC 342 Soil Fertility Laboratory
SSC 361 Non-Agricultural Land Use and Management
SSC (PM) 370 Alternative Agricultural Systems
SSC 452 Soil Classification
SSC 461 Soil Physical Properties and Plant Growth
SSC (CS) 462 Soil-Crop Management Systems
SSC 472 Forest Soils

Veterinary Science

VMF 401 Poultry Diseases
VMF 420 Diseases of Farm Animals

Zoology

ZO (FW) 221 Conservation of Natural Resources
ZO (FW) 353 Wildlife Management
ZO 419 Limnology
ZO (FW) 430 Fisheries-Wildlife Administration
ZO (ENT) 582 Medical and Veterinary Entomology

Group D

HUMANITIES AND SOCIAL SCIENCES[1]

The student is required to complete 21 semester hours of Group D courses in all degree programs in the College of Agriculture and Life Sciences. The student must take 6 semester hours from Area I and 6 semester hours from Area II courses. The remaining 9 hours may come from any courses in Area III. Not more than 6 semester hours are to come from one department. A course in Economics and a course in Sociology are highly recommended.

[1]Includes only courses in humanities and social sciences on approved Master Lists available from 115 Patterson Hall or adviser.

AREA I

Humanities (6 semester hours)

Courses from approved Master List I in the following disciplines:

English Language Literature
Foreign Language—courses at 200-level or above[2]
History
History of Art
Music—courses at 200-level or above
Philosophy
Religion

AREA II

Social Sciences (6 semester hours)

Courses from approved Master List II in the following disciplines:

Anthropology
Economics-Business
Political Science
Psychology
Sociology

AREA III

Humanities or Social Sciences (9 semester hours)

Courses from any of the three approved Master Lists:

Any Master List I course—Humanities
Any Master List II course—Social Sciences
Any Master List III course—Supplemental courses (Architecture, Communication, Design, Education, English Language Writing, Landscape Architecture, Political Science, Recreation Resources Administration, Social Work, Multidisciplinary Studies)

[2]Foreign language at the 100-level may be used to satisfy the college language requirement.

ADULT AND COMMUNITY COLLEGE EDUCATION

(See Graduate Catalog.)

AGRONOMY

Williams Hall

Professor J. C. Wynne, *Head of the Crop Science Department*

Professor E. J. Kamprath, *Head of the Soil Science Department*

Associate Professor J. M. DiPaola, *Undergraduate Coordinator—Crop Science*

Associate Professor H. J. Kleiss, *Undergraduate Coordinator—Soil Science*

Agronomy is the development and practical application of plant and soil sciences to produce abundant, high quality food, feed, fiber and other crops. Agronomists serve a vital role in world agriculture and environmental quality. Student may earn a Bachelor of Science degree under the technology curriculum of the College of Agriculture and Life Sciences with a major of Agronomy. The agronomy curriculum is administered jointly by the Departments of Crop Science and Soil Science. Crop science related primarily to the genetics, breeding, physiology, and management of field and turf crops. Soil science is oriented toward soil physics, chemistry, origin, microbiology, fertility, and management. For further information, see Crop Science or Soil Science.

CURRICULUM IN AGRONOMY

TECHNOLOGY PROGRAM

	Credits
ALS 103 Introductory Topics in ALS	1

Languages (12 Credits)

ENG 111 Composition and Rhetoric 3
ENG 112 Composition and Reading 3
COM (SP) 110 Public Speaking 3
Literature Elective 3

Humanities and Social Sciences
(21 Credits)

Electives (EB 212 required for CP, SS, and TM; EB 212 and EB 202 or EB 301 for Agr B; ENG 333 for SS) 21

Physical and Biological Sciences
(31-35 Credits)

BO 421 Plant Physiology *or*
MB 401 General Microbiology (SS) 4
BS 100 General Biology 4
CH 101 General Chemistry I 4
CH 103 General Chemistry II *or*
CH 107 Principles of Chemistry (BS, SS) 4
MA 111 Precalculus Algebra and Trigonometry 3
MA 121 Elements of Calculus *or*
MA 131 Analytic Geometry and Calculus A (BS,SS and Agr-B) *or*
MA 114 Introduction to Finite Mathematics with Applications 4-3
PY 221 College Physics 5
SSC 200 Soil Science 4

Physical Education and Free Electives
(17 Credits)

PE 100 Health & Physical Fitness 1
Physical Education 3
Free Electives 13

Agronomy Requirements
(22-24 Credits)

CS 211 Introduction to the Crop Plant 2
CS 212 Introduction to Crop Management 2
CS 411 Environmental Aspects of Crop Production 2
CS 413 Plant Breeding (except SS) 2
CS 414 Weed Science 4
CS 490 Senior Seminar in Crop Science *or*
SSC 490 Senior Seminar in Soil Science 1
SSC 341 Soil Fertility and Fertilizers 3
SSC 342 Soil Fertility and Fertilizers Lab 1
SSC 452 Soil Classification 4
SSC 461 Soil Physical Properties and Plant Growth 3

Advised Electives (21-25 Credits)

CH 220 Introductory Organic Chemistry (CP, TM, Agr B, SS) *or*
CH 221 Organic Chemistry I (BS) 4
GN 301 Genetics in Human Affairs *or*
GN 411 Principles of Genetics (except SS) 3-4
MEA 101 Geology I: Physical (SS) 3
MEA 110 Geology I Lab (SS) 1

Concentrations (Students are to select one concentration and complete the requirement as listed) 14-18

Minimum Hours Required for Graduation 130

CROP PRODUCTION (CP)

CS 214 Crop Science Laboratory 1
CS 312 Pastures and Forage Crops 3
EB 303 Farm Management 3
PP 315 Principles of Plant Pathology *or*
ENT 312 Introduction to Economic Entomology 4-3
SSC (CS) 462 Soil-Crop Management Systems 3
Elective 2-4
15-18

TURFGRASS MANAGEMENT (TM)

CS 214 Crop Science Laboratory 1
CS 315 Turf Management 3
EB 326 Human Resource Management 3
HS 342 Landscape Horticulture 3
PP 315 Principles of Plant Pathology *or*
ENT 312 Introduction to Economic Entomology 4-3
Elective 2-4
15-18

BASIC SCIENCES (BS)

BCH 451 Elementary Biochemistry 3
CH 223 Organic Chemistry II 4
CS 214 Crop Science Laboratory 1
MB 401 General Microbiology *or*
BO (ZO) 414 Cell Biology 4-3
PP 315 Principles of Plant Pathology *or*
ENT 312 Introduction to Economic Entomology 4-3
14-16

SOIL SCIENCES (SS)

BAE (SSC) 323 Water Management 4
CS 214 Crop Science Laboratory 1
SSC 361 Non-Agricultural Land Use & Management 3
SSC (CS) 462 Soil-Crop Management 3
Advised Elective 3
Statistics or Computer Sci. Elective 3
17

AGRONOMIC BUSINESS (AGR B)

Crops and Soils
PP 315 Principles of Plant Pathology *or*
ENT 312 Introduction to Economic Entomology 4-3
SSC (CS) 462 Soil-Crop Management Systems 3

Principles of Economics
EB 202 Economics II[1] *or* EB 301 Intermediate Microeconomics[1]
EB 212 Economics of Agriculture[1]
[1] *Taken as Social Science/Humanities (Group D) electives*

Principles of Accounting
ACC 210 Accounting I 3

Business Courses (Select one course from each of two of the following six areas) 6
15-16

Managerial Economics
EB 303 Farm Management
EB 325 Managerial Economics
Finance
EB 415 Farm Appraisal and Finance
EB 420 Financial Management of Corporations
Personnel
EB 326 Human Resource Management
EB 332 Industrial Relations
EB 431 Labor Economics[2]
Marketing
EB 311 Agricultural Markets
EB 313 Marketing Methods
EB 430 Agricultural Price Analysis[2]
Law
EB 306 Agricultural Law

Public Policy
EB 410 Public Finance[2]
EB 413 Competition, Monopoly, and Public Policy[2]
EB 436 Environmental Economics[2]
EB 433 U.S. Agricultural Policy[2]

[2] Require EB 301 as prerequisite. EB 301 may be taken as an extra elective or may be substituted for EB 202 above.

AGRICULTURAL AND RESOURCE ECONOMICS

Patterson Hall (Room 216)

Professor R. A. Schrimper, *Interim Head*

Professor C. L. Moore, *Associate Head and Extension Specialist-in-Charge*

Professor D. K. Pearce, *Administrator, Economics Graduate Programs*

Professor L. A. Ihnen, *Undergraduate Programs Coordinator*

TEACHING AND RESEARCH

Professors: G. A. Carlson, A. J. Coutu, A. R. Gallant, T. J. Grennes, D. M. Hoover, P. R. Johnson, T. Johnson, E. C. Pasour, Jr., R. J. Peeler, Jr., R. K. Perrin, D. A. Sumner, M. K. Wohlgenant; *Adjunct Professor:* J. B. Hunt, Jr.; *Professors Emeriti:* R. A. King, J. A. Seagraves, R. L. Simmons, J. G. Sutherland (USDA), W. D. Toussaint, J. C. Williamson, Jr.; *Associate Professors:* R. B. Palmquist, R. R. Rucker, W. N. Thurman; *Associate Professor Emeritus:* H. C. Gilliam, Jr. (USDA); *Assistant Professors:* J. C. Beghin, R. N. Collender, P. L. Fackler, W. E. Foster; *Assistant Professor Emeritus:* J. C. Matthews, Jr.; *Lecturers:* A. M. Beals, Jr., J. W. Bertha, S. C. Rhudy, S. L. Robinson, H. A. Sampson, III; *Adjunct Instructor:* W. A. Graham, III.

EXTENSION

Professors: R. D. Dahle, L. E. Danielson, J. E. Easley, Jr., W. D. Eickhoff, H. L. Liner, D. F. Neuman, M. L. Walden, R. C. Wells; *Professors Emeriti:* R. C. Brooks, D. G. Harwood, Jr., T. E. Nichols, Jr., C. R. Pugh, W. L. Turner, C. R. Weathers; *Associate Professors:* G. A Benson, E. A. Estes, D. L. Hoag, C. D. Safley, K. D. Zering; *Associate Professors Emeriti:* J. G. Allgood, R. S. Boal, D. D. Robinson, P. S. Stone; *Assistant Professors:* T. R. Fortenbery, A. R. Oltmans; *Assistant Professor Emeritus:* E. M. Stallings; *Extension Specialists:* R. N. Barnes, R. H. Usry.

The Department of Agricultural and Resource Economics serves agriculture, resource and related industries through its extension, research and teaching programs. Applying principles of economics and related disciplines, these programs develop understanding of contemporary economic and business problems and equip students with a knowledge of business organization fundamentals and decision-making skills useful in the operation and management of business firms.

The department offers undergraduate programs leading to Bachelor of Science degrees in agricultural business management and in agricultural economics. A concentration in biological sciences is also offered within the agricultural business management program. The agricultural business management program prepares graduates for management, marketing, sales, finance and related careers. The agricultural economics program provides a similar background in economics and business together with the opportunity for more extensive coursework in basic and applied sciences and prepares graduates for business careers and advanced study. The concentration in biological sciences prepares graduates for management, marketing, and sales careers in fields such as biotechnology, pharmaceuticals, health care, environmental protection, food processing and finance dealing with biological issues. This concentration is designed to be an attractive option for students with a strong background and interest in science who seek alternative to technical science careers.

For a description of related programs offered by the Division of Economics and Business, see the listing under the College of Humanities and Social Sciences.

OPPORTUNITIES

The growing number of specialized business firms producing and marketing services and products in agriculture, resource and life science-related industries has created an increasing demand for graduates trained in agricultural and biological business management and agricultural economics. Employment opportunities include careers with companies purchasing, processing, and marketing food, fiber and realted products; firms producing and marketing production inputs (feed, equipment, chemicals, drugs, etc.) and services; banks; other financial and credit agencies; and cooperatives.

Many graduates pursue careers in research and education with various agencies of the federal and state governments. These agencies include the Agricultural Extension Service,

the Agricultural Research Service, the State Department of Agriculture and the United States Department of Agriculture.

CURRICULUM IN AGRICULTURAL BUSINESS MANAGEMENT

	Credits
ALS 103 Introductory Topics in ALS	1
Languages (12 Credits)	
ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
COM (SP) 110 Public Speaking *or*	
COM (SP) 146 Business and Prof. Commun.	3
Elective English or foreign language literature)	3
Humanities and Social Sciences (21 Credits)	
EB 202 Economics II	3
EB 212 Economics of Agriculture	3
Electives (Group D)	15
Physical and Biological Sciences (29 Credits)	
BS 100 General Biology	4
CH 101 General Chemistry I	4
CSC 200 Intro. to Computers & Their Uses *or*	
BAE 241 Computer Applications in Agri. & Life Sci.	3
MA 111 Precalculus Algebra & Trigonometry	3
MA 114 Intro. to Finite Math. Appl.	3
MA 121 Elements of Calculus, *or*	
MA 131 Analytic Geometry & Calc. A	4
PY 221 College Physics	5
Bio. Sci. Elect. (From Group A *or* GN 301, NTR 301 or SSC 200)	3
Physical Education and Free Electives (17 Credits)	
PE 100 Health and Physical Fitness	1
Physical Education Electives	3
Free Electives	13
Departmental Requirements and Electives (50 Credits)	
ACC 210 Accounting I, *or*	
ACC 280 Managerial Accounting	3
EB 301 Intermediate Microeconomics	3
EB 302 Intermediate Macroeconomics	3
EB 303 Farm Management, *or*	
EB 325 Managerial Economics	3
EB 306 Agricultural Law, *or*	
EB 307 Business Law I	3
EB 311 Agricultural Markets, *or*	
EB 313 Marketing Methods	3
EB 326 Human Resource Management, *or*	
EB 332 Industrial Relations, *or*	
EB 431 Labor Economics	3
EB (ST) 350 Economics and Business Statistics	3
EB 320 Financial Mgmt. *or*	
EB 415 Farm Appraisal & Finance *or*	
EB 404 Money, Financial Markets & the Economy	3
EB 433 U. S. Agricultural Policy	3
Technical agriculture electives (from Group C or Forestry)	9
Departmental or technical agriculture electives	11
Minimum hours for graduation	130

CURRICULUM IN AGRICULTURAL BUSINESS MANAGEMENT WITH CONCENTRATION IN BIOLOGICAL SCIENCES

	Credits
ALS 103 Introductory Topics in ALS	1
Languages (12 Credits)	
ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
COM (SP) 110 Public Speaking *or*	
COM (SP) 146 Bus. & Prof. Communication	3
Elective (English or Foreign Language Literature	3
Humanities and Social Sciences (21 Credits)	
EB 212 Economics of Agriculture	3
EB 301 Intermediate Microeconomics	3
HI 322 Rise of Modern Science	3
HI 341 Technology in History	3
COM (SP) 201 Persuasion Theory	3
Elective (Ethics, Philosophy *or* Religion)	3
Elective (Group D)	3
Physical and Biological Sciences (42 Credits)	
BAE 221 Agri. Microcomputer Appl. *or*	
BAE 241 Computer Application in ALS	3
BO 200 Plant Life *or*	
MB 401 General Microbiology	4
BO (ZO) 360 Intro. to Ecology *with*	
BO (ZO) 365 Ecology Laboratory *or*	
BO 400 Plant Diversity *or*	
ZO 330 Vertebrate Zoology *or*	4
ZO 450 Evolutionary Biology	3
BS 100 General Biology	4
CH 101 General Chemistry I	4
CH 103 General Chemistry II *or*	
CH 107 Principles of Chemistry	4
GN 301 Genetics in Human Affairs *or*	3
GN 411 Principles of Genetics	4
MA 114 Intro. to Finite Math. *or*	
MA 231 Anly. Geometry & Calculus B	3
MA 121 Elements of Calculus *or*	
MA 131 Anly. Geometry & Calculus A	4
PY 221 College Physics	5
ZO 201 General Zoology *or*	
ZO 205 Intro. Cell & Dev. Zoo. *or*	
ZO 208 Intro. Org. & Evol. Zoo.	4

Physical Education and Free Electives
(18 Credits)

PE 100 Health and Physical Fitness 1
Physical Education Electives 3
Free Electives 12

Departmental Requirements and Electives
(45 Credits)

ACC 280 Managerial Accounting *or*
ACC 220 Accounting II 3
EB 302 Intermediate Macroeconomics 3
EB 303 Agricultural Law 3
EB 311 Agricultural Markets *or*
EB 413 Marketing Methods 3
EB 320 Financial Management *or*
EB 415 Farm Appraisal and Finance 3
EB 325 Managerial Economics 3
EB (ST) 350 Econ. & Bus. Stat. *or*
St 361 Intro. Stat. for Engineers 3
ENG 331 Commun. for Engr. & Tech. *or*
ENG 332 Commun. for Bus. Mgt. *or*
ENG 333 Commun. for Sci. & Res. 3
Departmental Elective (from DARE courses) 3
Departmental Electives (from DARE *or*
other CALS courses 11

Minimum Hours for Graduation 130*

*Must include at least 6 hours of 400 or 500 level courses.

MINOR IN AGRICULTURAL BUSINESS MANAGEMENT

The Department of Agricultural and Resource Economics offers a minor in Agricultural Business Management. This minor provides students an opportunity to learn basic concepts useful in many careers in agricultural business. A total of 15 hours of coursework is required, including EB 212, ACC 280, EB 303 or EB 311 and two additional courses chosen from a list of selected agricultural economics and business-related courses. Consult the Department for specific information.

CURRICULUM IN AGRICULTURAL ECONOMICS

SCIENCE PROGRAM

Credits

ALS 103 Introductory Topics in ALS 1

Languages (12 Credits)

ENG 111 Composition and Rhetoric 3
ENG 112 Composition and Reading 3
Elective (English or foreign language literature) ... 3
Elective (Language or communication) 3

Humanities and Social Sciences
(21 Credits)

EB 202 Economics I 3
EB 212 Economics of Agriculture 3
Electives (Group D) 15

Physical Biological Sciences
(36 Credits)

BS 100 General Biology, *or*
BS 105 Biology in the Modern World 4
CH 101 General Chemistry I 4
CH 103 General Chemistry II 4
CSC 200 Introduction to Computers, *or*
BAE 241 Comp. Appl. in Agri. & Life Sci. 3
MA 111 Precalculus Algebra and Trigonometry .. 3
MA 114 Introduction to Finite Mathematics 3
MA 131 Analytic Geometry and Calculus A 4
MA 231 Analytic Geometry and Calculus B 3
PY 221 College Physics 5
Bio. Sci. Elec. (From Group A *or*
GN 301, NTR 301 or SSC 200) 3

Physical Education & Free Electives
(17 Credits)

PE 100 Health and Physical Fitness 1
Physical Education Electives 3
Free Electives 13

Group A and C Electives
(11 Credits)

Electives 11

Departmental Requirements and Electives
(32 Credits)

ACC 210 Accounting I, *or*
ACC 280 Managerial Accounting 3
EB 301 Intermediate Microeconomics 3
EB 302 Intermediate Macroeconomics 3
EB (ST) 350 Economics and Business Statistics ... 3
EB 433 U.S. Agricultural Policy 3
Electives (Agricultural Economics, EB
303, 311, 415, 430, 436, 515, 521,
523, 533, or 551) 9
Electives (Any ACC or EB or other
course approved by Undergraduate
Coordinator) 8

Minimum hours for graduation 130

MINOR IN AGRICULTURAL ECONOMICS

The Department of Agricultural and Resource Economics offers a minor in Agricultural Economics. This minor provides students an introduction to agricultural economics training that complements training in agriculture and applied sciences and will be especially useful for further training at the graduate level. A total of 15 hours of coursework is required, including EB 212 or EB 201, EB 301, EB 433 and two additional courses chosen from a selected list of agricultural economics courses. Consult the department for additional information.

ANIMAL SCIENCE

Polk Hall (Room 123)

Professor L. S. Bull, *Head of the Department*

Associate Professor M. T. Coffey, *Associate Department Head for Extension*

Associate Professor J. C. Cornwell, *Undergraduate Coordinator*

Associate Professor K. L. Esbenshade, *Graduate Administrator*

TEACHING AND RESEARCH

Distinguished University Research Professor: C. L. Markert

Alumni Distinguished Undergraduate Professor: K. R. Pond

William Neal Reynolds Professors: J. G. Lecce, E. J. Eisen

Professors: J. H. Britt, E. V. Caruolo, A. J. Clawson, W. J. Croom, Jr., D. G. Davenport, R. W. Harvey, W. L. Johnson, E. E. Jones, C. L. Market, B. T. McDaniel, R. M. Petters, B. R. Poulton, A. H. Rakes, H. A. Ramsey, O. W. Robison, J. W. Spears, J. C. Wilk; *Professors Emeriti:* E. R. Barrick, L. Goode, C. A. Lassiter, J. M. Leatherwood, J. E. Legates, R. D. Mochrie, R. M. Myers, I. D. Porterfield, F. H. Smith, L. C. Ulberg, G. H. Wise; *Associate Professors:* B. P. Alston-Mills, M. D. Whitacre; *Adjunct Associate Professors:* F. C. Gunsett, E. C. Segerson, Jr.; *Associate Professors Emeriti:* E. U. Dillard, J. J. McNeil; *Assistant Professors:* J. D. Armstrong, C. E. Farin, U. G. Whitworth, Jr.; *Lecturer:* D. T. Barnett; *Research Associates:* J. M. Luginbuhl, K. Momoi, M. L. Reed, M. D. Sanchez; *Teaching Technician:* M. G. Hamm. *Associate Members of the Faculty:* J. C. Burns (Crop Science), R. G. Crickenberger (NCAES), W. M. Hagler (Plant Pathology, Poultry Science), D. K. Larick (Food Science).

EXTENSION

Associate Professor R. L. McCraw, *Coordinator Animal Husbandry*

Professor D. P. Wesen, *Coordinator Dairy Husbandry*

Associate Professor M. T. Coffey, *Coordinator, Swine Husbandry*

Associate Professor: R. A. Mowrey, Jr., *Coordinator, Horse Husbandry*

Professors: K. R. Butcher, J. R. Jones, F. D. Sargent, C. M. Stanislaw, L. W. Whitlow; *Professors Emeriti:* A. V. Allen, R. F. Behlow, T. C. Blalock, J. S. Buchanan, G. Hyatt, Jr., F. N. Knott, G. S. Parsons, J. W. Patterson, J. R. Woodard; *Associate Professor:* R. E. Lichtenwalner; *Assistant Professors:* W. L. Flowers, B. A. Hopkins, W. E. M. Morrow, M. H. Poore, W. D. Schoenherr, S. P. Washburn; *Extension Specialists:* B. C. Allison, M. C. Claeys, J. S. Clay, G. M. Gregory, J. H. Gregory, R. M. Hughes, D. C. Miller, J. W. Parker, Jr., R. W. Swain.

Animal Science is a broad field centered on the biology, production, and management of economically important farm and companion animals. Domestic livestock have, throughout history provided man with a major source of food, fiber, pleasure and companionship. Undergraduate students study subjects related to various phases of animal science. Courses are offered in nutrition, physiology, breeding and management, and there are opportunities for the application of basic scientific training in the husbandry areas. Options for course selection by each student make it possible for those with varying backgrounds and wide-ranging interests to become involved in stimulating and rewarding experiences.

OPPORTUNITIES

Opportunities for animal scientists are boundless and the areas of emphasis are diverse. Animal Science graduates are qualified for positions in a wide variety of areas such as: livestock management, feed and animal health product companies, livestock marketing, meat processing industries, feedlot managers or consultants, state and federal departments of agriculture, breed associations, education, financial institutions, livestock publications, technical service managers, animal technicians, media specialists, agricultural extension service and public relations. Animal scientists can be found across the nation and around the world in all phases of production, research, sales, service, business and education. Many students in pre-veterinary medicine obtain degrees in animal science. Students may elect graduate study, after which they will find opportunities in teaching, research and extension. See listing of graduate degrees offered.

CURRICULA IN ANIMAL SCIENCE

The degree of Bachelor of Science with a major in animal science may be obtained under either the science or technology curricula offered in Agriculture and Life Sciences. For the basic requirements and freshman year refer to those sections under College of Agriculture and Life Sciences.

SCIENCE PROGRAM

	Credits
ALS 103 Introductory Topics in ALS	1
Languages (12 Credits)	
ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
COM (SP) 110 Public Speaking	3
Literature Elective	3
Humanities and Social Sciences (21 Credits)	
EB 212 Economics of Agriculture	3
Electives	18
Physical and Biological Sciences (26-31 Credits)	
BS 100 General Biology	4
CH 101 General Chemistry I	4
CH 107 Principles of Chemistry	4
MA 111 Precalculus Algebra and Trigonometry	3
MA 131 Analytic Geometry & Calculus A *or*	
MA 114 Intro. to Finite Math with Appl.	4-3
PY 221 College Physics *or*	
PY 211 & 212 College Physics I, II	5-8
ZO 303 Vertebrate Zoology *or*	
ZO 323 Comparative Anatomy *or*	
ZO 421 Principles of Physiology	4-3
Physical Education and Free Electives (17 Credits)	
PE 100 Health & Physical Fitness	1
Physical Education Electives	3
Free Electives	13
Group A, B, C, Courses (26-29 Credits)	
CH 221 Organic Chemistry I	4
CH 223 Organic Chemistry II	4
GN 411 The Principles of Genetics	4
MB 401 General Microbiology	4
Other (Recommend inclusion of BCH 451, ST 311, EB 303, ANS 210 *or* BAE 241 *or* CSC 200)	10-13
Departmental Requirements and Electives (27 Credits)	
ANS 100 Perpectives in Animal Science	1
ANS 200 Introduction to Animal Science	4
ANS (PO) 204 Feeds and Feeding	4
ANS 311 Livestock Breeding and Improvement	3
ANS 330 Reproductive Physiology	3
ANS (PO, NTR) 415 Comparative Nutrition	3
ANS 490 Seminar in Animal Science	1
Select a minimum of 8 credits from: (At least 6 hrs. must be from management** courses)	
ANS 201 Techniques of Animal Care	2
ANS 202 Techniques of Horse Care	2
ANS 300 Animal Production Field Study Trip	1
ANS 302 Livestock and Dairy Evaluation	3
ANS 303 Principles of Equine Evaluation	2
ANS 310 Basic Horse Husbandry	3
ANS (FS) 322 Muscle Foods and Eggs	3
ANS (FS) 324 Milk and Dairy Production	3
**ANS 402 Beef Cattle Management	3
**ANS 403 Swine Management	3
**ANS 404 Dairy Cattle Management	3
ANS 405 Lactation	3

**ANS 406 Sheep Management 3
**ANS 410 Equine Management 3
ANS 412 Applied Animal Breeding 1-4
VMF 420 Diseases of Farm Animals 3

Minimum Hours Required for Graduation 130

(See also Pre-Professional Program in Veterinary Medicine)

TECHNOLOGY PROGRAM

Credits

ALS 103 Introductory Topics in ALS 1

Languages (12 Credits)

ENG 111 Composition and Rhetoric 3
ENG 112 Composition and Reading 3
COM (SP) 110 Public Speaking 3
Literature Elective 3

Humanities and Social Sciences (21 Credits)

EB 212 Economics of Agriculture 3
Electives 18

Physical and Biological Sciences
(27-31 Credits)

BS 100 General Biology 4
CH 101 General Chemistry I 4
CH 103 General Chemistry II *or*
CH 107 Principles of Chemistry 4
MA 111 Precalculus Algebra and Trigonometry 3
MA 131 Analytical Geometry & Calculus A *or*
MA 114 Introduction to Finite Math with Appl. 4-3
PY 221 College Physics *or*
PY 211 & 212 College Physics I, II 5-8
Biological Science Elective 4

Physical Education and Free Electives (16 Credits)

PE 100 Health & Physical Fitness 1
Physical Education Electives 3
Free Electives 13

Group A, B, C Electives (25 Credits)

ANS 330 Reproductive Physiology 3
CH 220 Introductory Organic Chemistry 4
GN 301 Genetics in Human Affairs *or*
GN 411 Principles of Genetics 3-4
Group A, B or C Electives (Recommend inclusion of ANS 210
or BAE 241 *or* CSC 200) 9
Group B Electives (Recommend inclusion of EB 303) 6

Departmental Requirements and Electives (27 Credits)

ANS 100 Perspectives in Animal Science 1
ANS 200 Introduction to Animal Science 4
ANS 204 Feeds and Feeding 4
ANS 311 Livestock Breeding and Improvement 3
ANS (NTR, PO) 415 Comparative Nutrition 3
ANS 490 Seminar in Animal Science 1
Select a minimum of 9 credits from: (At least 6 hrs. must be from management** courses)
ANS (FS) 322 Muscle Foods and Eggs 3
ANS (FS) 324 Milk and Dairy Products 3
**ANS 402 Beef Cattle Management 3
**ANS 403 Swine Management 3
**ANS 404 Dairy Cattle Management 3
ANS 405 Lactation 3
**ANS 406 Sheep Management 3
**ANS 410 Equine Management 3
VMF 420 Diseases of Farm Animals 3
Select a minimum of 2 hours from:
ANS 201 Techniques of Animal Care 2
ANS 202 Techniques of Horse Care 2
ANS 300 Animal Production Field Study Trip 1
ANS 302 Livestock and Dairy Evaluation 3

ANS 303	Principles of Equine Evaluation	2
ANS 320	Basic Horse Husbandry	3
ANS (FS, PO) 322	Muscle Foods and Eggs	3
ANS (FS) 324	Milk and Dairy Products	3
ANS 402	Beef Cattle Management	3
ANS 403	Swine Management	3
ANS 404	Dairy Cattle Management	3
ANS 405	Lactation	3
ANS 406	Sheep Management	3
ANS 410	Horse Science	3
ANS 412	Applied Animal Breeding	1-4
VMI 420	Diseases of Farm Animals	3
	Minimum Hours Required for Graduation	130

MINOR IN ANIMAL SCIENCE

A minor in Animal Science is open to all interested baccalaureate students. This minor is designed primarily to complement curricula in Agricultural Business Management, Agricultural Economics, Agricultural Education, Agronomy, Food Science, Poultry Science, and Zoology. Students completing a minor in Animal Science will become familiar with animal production and with its related industries, their fundamental components, terminology, and dynamic nature. The minor requires a minimum of 15 credit hours, and its course of study is flexible in order that students may emphasize the discipline or species of their interest.

BIOCHEMISTRY

Polk Hall (Room 128)

Professor P. F. Agris, *Head of the Department*

Professor H. R. Horton, *Undergraduate Coordinator*

University Professors: F. R. Armstrong, E. C. Theil

Alumni Distinguished Undergraduate Professor and William Neal Reynolds Professor: H. R. Horton

Professors: W. L. Miller, J. D. Otvos, E. C. Sisler; *Professors Emeriti:* F. B. Armstrong, J. S. Kahn, I. S. Longmuir, S. B. Love; *Associate Professors:* J. A. Knopp, E. S. Maxwell; *Adjunct Associate Professor:* E. L. Treadwell; *Assistant Professors:* L. K. Hanley-Bowdoin, C. C. Hardin; *Research Associates:* J. Chen, P. N. Lin; *Associate Members of the Faculty:* E. E. Jones (Animal Science), R. R. Sederoff (Forestry, Genetics) H. E. Swaisgood (Food Science).

The Biochemistry program provides B.S. graduates with the scientific background and skills required for employment in university, industrial, state, and federal research laboratories. The curriculum is especially suited to students preparing for graduate study in biochemistry, molecular biology, biotechnology, medical, and related fields. It emphasizes the fundamentals of biological and physical sciences, offering students breadth of knowledge and depth of understanding. The curriculum provides students with broad experience in biological and chemical laboratories and encourages the development of experimental skills. Opportunities are provided for highly qualified students to undertake honors research during their junior and/or senior years.

BIOCHEMISTRY CURRICULUM

ALS 103	Introductory Topics in ALS	1
	Languages (12 Credits)	
ENG 111	Composition and Rhetoric	3
ENG 112	Composition and Reading	3
FL	Foreign Language	6

Humanities and Social Sciences (21 Credits)

Electives must include 6 credit hours each from the humanities and the social sciences. 21
Also, at least one literature course must be included within the required 21 credit hours.

Mathematical Science and Physics (21-23[1] Credits)

MA 141[1], 241[1], 242[1] Analytic Geometry and Calculus I, II, and III (4,4,4)
or
MA 131, 231, ST 311 Analytic Geometry and Calculus A and B (4,3) and Introduction to Statistics (3) ..... 12[1]-10
Computer, Mathematics, or Statistics elective (3) 3
PY 205[1], 208[1] General Physics (4,4)
or
PY 211, 212 College Physics I, II (4,4) 8

Chemistry and Laboratory Analysis (23-26[1] Credits)

CH 101, 107 General Chemistry (4) and Principles of Chemistry (4) 8
CH 221, 223 Organic Chemistry I and II (4,4) 8
CH 431[1], 433[1] Physical Chemistry I and II (3,3) *or*
CH 331 Introductory Physical Chemistry ..... 6[1]-4
Laboratory Analysis elective: e.g., CH 315 (4) or CH 428[1] (3) ..... 4-3[1]

Life Sciences (34-35 Credits)

BS 100 General Biology 4
Life Sciences electives (must include both animal and plant science courses, and a course in physiology or cell biology) 11-12
BCH 150 Introductory Biochemical Concepts 2
BCH 451, 452 Introductory Biochemistry and Laboratory (3,2) 5
BCH 453 Introduction to Molecular Biology and Metabolism 3
MB 401 General Microbiology 4
GN 411 Principles of Genetics 4
Laboratory or Library Research (e.g., BCH 490) 1

Electives (16-18 Credits)

Technical electives (Advised) 0-2
Free electives 12
Physical Education (PE 100 plus Physical Education Electives) 4

Minimum Hours Required for Graduation 130

[1] Recommended for students preparing for graduate study in Biochemistry.

BIOLOGICAL AND AGRICULTURAL ENGINEERING

(Also see Engineering.)

David S. Weaver Laboratories (Room 100)

Professor J. H. Ruff, *Head of Department*

Professor R. S. Sowell, *Graduate Administrator*

Professor G. B. Blum, Jr., *Undergraduate Coordinator*

TEACHING AND RESEARCH

Alumni Distinguished Undergraduate Professor: G. B. Blum, Jr.

William Neal Reynolds Professor: R. W. Skaggs

Professors: C. F. Abrams, Jr., E. G. Humphries, W. H. Johnson, G. J. Kriz, W. F. McClure, R. P. Rohrbach, L. M. Safley, Jr., R. W. Skaggs, L. F. Stikeleather, C. W. Suggs, P. W. Westerman, T. B. Whitaker (USDA), D. H. Willits, J. H. Young. *Professors Emeriti:* H. D. Bowen, J. W. Dickens, J. M. Fore, G. W. Giles, F. J. Hassler, E. L. Howell, D. H. Howells, J. W. Weaver, Jr., E. H. Wiser; *Associate Professor* G. R. Baughman, R. W. Bottcher, C. G. Bowers, Jr., *Assistant Professors* R. D. Huffman, J. E. Parsons; *Adjunct Assistant Professors* G. M. Jividen, S. K. Seymour; *Instructor* M. D. Tuttle; *Research Associate* C. Murugaboopathi; *Associate Members of the Faculty* D. D. Hamann, V. A. Jones, T. M. Losordo (Zoology), K. R. Swartzel (Food Science), A. E. Hassan (Forestry), D. C. Richardson (Companion Animal & Special Species Medicine), T. M. Losordo (Zoology); *Senior Researcher:* S. C. Mohapatra.

EXTENSION

Professor: F. J. Humenik, *Associate Head in Charge of Extension*

Professors: J. C. Barker, L. B. Driggers, R. E. Sneed; *Professors Emeriti:* E. O. Beasley, H. M. Ellis, J. W. Glover, R. W. Weaver; *Associate Professor:* A. R. Rubin; *Associate Professor Emeritus:* W. C. Warrick; *Assistant Professor:* G. D. Jennings; *Extension Specialists:* J. A. Arnold, S. L. Brichford, S. W. Coffey, R. O. Evans, Jr., R. L. McLymore.

Biological and Agricultural Engineering is the engineering discipline that uses engineering principles to solve problems and improve situations involving biological and agricultural systems. The goals are to improve efficiency, conserve natural resources, protect the environment and, in general, to contribute to improving the quality of life as impacted by biological and agricultural systems.

Two curricula are offered, Biological and Agricultural Engineering and Agricultural Systems Technology. The Biological and Agricultural Engineering curriculum, which is accredited by the Accreditation Board of Engineering and Technology (ABET), leads to the degree Bachelor of Science in Biological and Agricultural Engineering. Graduates of the Agricultural Systems Technology curriculum receive the degree Bachelor of Science in Agricultural System Technology.

OPPORTUNITIES

Graduates of the Biological and Agricultural Engineering curriculum are qualified for positions in design, development and research in public institutions and in industry. This curriculum also provides adequate preparation for post-graduate work leading to advanced degrees. (See listing of graduate degrees offered.)

Those receiving degrees in Agricultural Systems Technology are qualified for positions in sales, services, and management of agribusinesses such as farm machinery, irrigation systems, etc.; as county agents or farmers; and for various types of agricultural advisory work.

CURRICULUM BIOLOGICAL AND AGRICULTURAL ENGINEERING

ENGINEERING PROGRAM

The engineering curriculum provides an educational program for students which uniquely prepares them for dealing with engineering problems in the biological and agricultural areas. Emphasis is placed on basic science and engineering courses such as mathematics, physics, mechanics, biology, soils, and thermodynamics which provide a sound background for the application of engineering to agricultural and biological problems.

Since biological and agricultural engineering involves the disciplines of biology, agriculture and engineering, the curriculum is a joint administered by the Colleges of Agriculture and Life Sciences and Engineering. Undergraduate freshmen entering this curriculum should enroll in the College of Engineering undesignated program and indicate SBU as their curriculum choice. After successfully completing the Engineering undesignated requirements the student will enter the Department of Biological and Agricultural Engineering.

For the engineering program in biological and agricultural engineering, refer to the College of Engineering section of the catalog.

AGRICULTURAL SYSTEMS TECHNOLOGY CURRICULUM

The Agricultural Systems Technology curriculum is intended to provide a broad overview of agricultural systems. The curriculum integrates courses from the physical, biological, and earth sciences with courses in agricultural production, mechanization, and management. Graduates are prepared to apply shop, mechanical, and information technology to the farm or agribusiness.

Listed below are the departmental requirements in the agricultural systems technology program.

	Credits
ALS 103 Introductory Topics in ALS	1
Languages (12 Credits)	
ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
COM (SP) 110 Public Speaking	3
Literature Elective	3
Humanities and Social Sciences (21 Credits)	
Group D Electives	12
EB 212 Economics of Agriculture	3
ENG 331 Commun. for Engr. & Tech.	3
SOC 241 Sociology Agr. and Rural Life	3
Mathematics and Statistics (13 Credits)	
MA 111 Precalculus Algebra and Trigonometry	3
MA 114 Intro. to Finite Math	3
MA 131 Analytic Geometry and Calculus A	4
ST 350 Economics and Business Statistics *or*	
ST 361 Intro. to Statistics for Engineers	3
Physical and Biological Sciences (28 Credits)	
BS 100 General Biology	4
CH 101 General Chemistry I	4
CH 103 General Chemistry II	4
PY 211 College Physics I	4
PY 212 College Physics II	4
SSC 200 Soil Science	4
Group A Electives (Biological Science)	4
Physical Education and Free Electives (17 Credits)	
PE 100 Health & Physical Fitness	1
Physical Education Electives	3
Free Electives	13
Departmental Requirements and Electives (38 Credits)	
BAE 201 Shop Processes and Management	3
BAE 211 Farm Machinery	3
BAE 221 Agr. Systems I	3
BAE 222 Agr. Systems II	3
BAE 311 Agr. Power and Machinery	3
BAE (SSC) 323 Water Management	3
BAE (SSC) 324 Elementary Surveying	1
BAE 331 Agr. Systems III	2
BAE 332 Farm Structures	3
BAE 333 Processing Agr. Products	4
BAE 343 Agr. Electrification	3
BAE 344 Circuits and Controls	1
BAE 441 Agr. Systems IV	3
BAE 442 Agr. Systems V	2
GC 101 Engineering Graphics I	2
Minimum Hours Required for Graduation	130

BIOLOGICAL SCIENCES

Bostian Hall (Room 2717)

Professor C. F. Lytle, *Undergraduate Coordinator*

Associate Professors: R. L. Beckmann, Jr. (Botany), M. N. Feaver (Zoology), B. C. Haning (Plant Pathology), B. M. Parker (Entomology); *Assistant Professor:* J. E. Mickle (Botany); *Teaching Technicians:* C. K. Heinsohn (Zoology), M. T. Lassiter (Entomology).

The biological sciences constitute a rapidly developing field offering many challenging and rewarding opportunities for well-trained students. The Biological Sciences Interdepartmental Program offers a B.S. degree in biological sciences for students seeking a comprehensive training in biology and the supporting sciences.

Many graduates of this program continue further studies in graduate schools in such diverse fields as botany, zoology, marine biology, physiology, genetics, biochemistry, biotechnology, pharmacology, and microbiology. Others attend professional schools in medicine, optometry, and veterinary medicine as well as other health-related fields.

The biological science curriculum provides a modern, flexible undergraduate program to prepare students for rewarding careers in research and teaching as well as in business, industry, research institutes and governmental agencies. A wide range of career opportunities are available in technical sales, manufacturing and quality control, environmental management, and other positions with pharmaceutical companies, food manufacturers, medical laboratories, public utilities, and other industries.

Biological science majors may elect a general program of study or one of several options and emphases including entomology, microbiology, and nutrition. A joint program with the Department of Mathematics and Science Education leads to a double major and a teaching certificate.

BIOLOGICAL SCIENCES CURRICULUM AND CONCENTRATIONS

GENERAL

	Credits
ALS 103 Introductory Topics in ALS	1
Languages (12 Credits)	
ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
Foreign Language	6
Humanities and Social Sciences (21 Credits)	
Humanities Electives	6
Social Science Electives	6
Humanities, Soc. Science or Supplimental Group D courses	9
Biological Sciences (37-38 Credits)	
BCH 451 Elementary Biochemistry	3
BO 200 Plant Life *or* BO 400 Plant Diversity	4
BO (ZO) 360 Introduction to Ecology	3
BO (ZO) 365 Ecology Lab	1
BO 421 Plant Pathology *or*	
BO (ZO) 414 Cell Biology *or*	
ZO 421 Principles of Physiology	3-4
BS 100 General Biology	4
BS 490 Senior Seminar	1
BS 492 External Learning Experience *or*	
BS 493 Special Problems in Biological Science *or*	
ALS 499 Honors Research/Teaching II	3
GN 411 Principles of Genetics	4
GN 412 Elementary Genetics Lab	1
MB 401 General Microbiology	4
ZO 201 General Zoology *or*	
ZO 303 Vertebrate Zoology *or*	
ZO 402 + ZO 403 Invertebrate Zoology and Lab	4
NOTE: Students electing ZO 421 or BO (ZO) 414 must also elect either ZO 305 Cellular and Animal Physiology Laboratory *or* BCH 452 Introductory Biochemistry Laboratory	2
Physical Sciences and Mathematics (34-36 Credits)	
CH 105 General Chemistry I	4
CH 107 Principles of Chemistry	4
CH 221, 223 Organic Chemistry I and II	8
MA 131, 231 Analytic Geometry and Calculus A and B *and*	7
BAE 221 Agricultural Systems I: Microcomputer Applications *or*	
CSC 200 Intro. to Computers and Their Uses *or*	
ST 311 Intro. to Statistics	3
or	
MA 141, 241, 242 Analytic Geometry & Calculus I, II and III	12
PY 211, 212 College Physics I, II	8
Physical Education and Electives (25-27 Credits)[1]	
Restricted Electives from Groups A, B, C, and D	9-11
Free Electives	12
PE 100 Health & Personal Fitness	1
Physical Education	3
Minimum Hours Required for Graduation	130

[1] Group A includes Occupational and Recreational Sciences; Group B, economics and business management; Group C, applied science and technology; Group D, humanities and social sciences.

ENTOMOLOGY CONCENTRATION

In addition to the general curriculum for the biological sciences, three additional entomology electives are required: ENT 312 or ENT 425 and ENT 503, plus three additional hours of entomology. For graduation, 130 semester credits hours are required.

NUTRITION CONCENTRATION

The nutrition concentration follows the general curricular requirements for the biological sciences program, except that students must take two courses from two departments in Group I: BO 200 *or* BO 400, ZO 201, ZO 303 *or* 402 *or* 403; one course from Group II: BO (ZO) 414, BO 421, ZO 421; and four courses in nutrition (FS 400, NTR 415, NTR 490, and NTR 516) are specifically required.

MICROBIOLOGY OPTION

Along with the general curriculum for the biological sciences, three additional microbiology electives are required: MB 411 and MB 501 are usually recommended. MB 401 is required in the BLS curriculum. For graduation, 130 semester credit hours are required.

(See also Pre-Professional Program in Veterinary Medicine.)

MINOR IN NUTRITION

The minor in nutrition will provide knowledge of the principles of nutrition that are needed to formulate balanced diets and to evaluate information and policies concerning foods and dietary practicers. Students may select courses to emphasize human or animal nutrition or a combination of these. For additional information consult Nutrition Program, 220B Polk Hall (737-2763).

BOTANY

Gardner Hall (Room 2214)

Professor E. D. Seneca, *Head of Department*

Professor C. G. Van Dyke, *Undergraduate Coordinator and Graduate Administrator*

University Research Professor: W. F. Thompson

Alumni Distinguished Undergraduate Professor: R. L. Beckmann

Professors: C. E. Anderson, U. Blum, R. J. Downs, R. C. Fites, J. W. Hardin, W. W. Heck (USDA), R. L. Mott, H. E. Pattee (USDA), J. R. Troyer, T. R. Wentworth, A. M. Witherspoon; *Professors Emeriti:* D. B. Anderson, G. R. Noggle, H. T. Scofield, L. A. Whitford; *Associate Professors:* W. F. Boss, J. M. Stucky, J. F. Thomas; *Assistant Professors:* R. S. Boston, J. M. Burkholder, J. E. Mickle; *Adjunct Assistant Professors:* D. E. Blume, R. A. Linthurst; *Teaching Technicians:* D. S. Wright; *Research Associates:* G. C. Allen, F. L. Booker, W. H. Gross, G. E. Hall, P. Venkatasubbaiah, M. J. White, D. W. Wolff; *Associate Members of the Faculty:* E. C. Sisler (Biochemistry), J. M. Anderson (USDA), K. O. Burkey (USDA), S. C. Huber (USDA), T. W. Rufty, Jr. (USDA), H. Seltmann (USDA) (Crop Science), D. E. Moreland (USDA) (Crop Science, Forestry), H. V. Amerson (Forestry), M. M. Goodman (Crop Science, Statistics, Genetics), L. B. Crowder (Zoology).

The instructional program provides classroom, laboratory, and field experience in the major areas of plant science. Undergraduates majoring in botany are given a broad background in the humanities and physical sciences and are encouraged to participate in independent study in the senior year. Majors, as preprofessionals in the plant sciences, are prepared for advanced study in botany and other biological fields, as well as in the applied

plant sciences such as horticulture, crop science, plant pathology, resource management and environmental biology.

OPPORTUNITIES

The undergraduate degree is an excellent preprofessional degree in the plant sciences. Many majors continue with graduate studies; see list of graduate degrees. After obtaining a graduate degree, the undergraduate major will be qualified for teaching positions in community and junior colleges, colleges and universities, for research positions in federal and state government laboratories and in private industry.

Research technician positions in many other life science areas in governmental and industrial laboratories are also career possibilities. The field of biotechnology provides additional technical opportunities. Field botanists and naturalists find employment in state and national park systems and nature interpretation programs.

CURRICULUM IN BOTANY

The Bachelor of Science degree with a major in botany is offered under the science curriculum of the College of Agriculture and Life Sciences. See the freshman year program listed. See also other basic requirements listed.

The Bachelor of Science degree with double concentration—one in economics, English, history, philosophy or political science, and another in botany—is available in the College of Humanities and Social Sciences. For details, refer to section on College of Humanities and Social Sciences.

SCIENCE PROGRAM

	Credits
ALS 103 Introductory Topics in ALS	1
Languages (12 Credits)	
ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
ENG 333 Commun. for Science & Res.	3
Language or Communication Elective	3
Humanities and Social Sciences (21 Credits)	
PHI 205 Problems and Types of Philosophy *or*	
PHI 333 Theory of Knowledge *or*	
PHI 340 Philosophy of Science *or*	
HI 321 Ancient and Medieval Science *or*	
HI 322 Rise of Modern Science	3
Electives from Group D[2]	18
Physical and Biological Sciences (31 Credits)	
BS 100 General Biology	4
CH 101 General Chemistry I	4
CH 103 General Chemistry II *or*	
CH 107 Principles of Chemistry	4
MA 111 Precalculus Algebra and Trigonometry	3
MA 131 Analytic Geometry and Calculus A[1]	4
PY 211, 212 College Physics I, II	8
ZO 201 General Zoology *or*	
ZO 302 Invertebrate Zoology *or*	
ZO 402 + 403 Vertebrate Zoology and Lab	4
Restricted Electives from Groups A and C (22 Credits)	
CH 220 Introductory Organic Chemistry[1]	4
CSC 101 Introduction to Programming	3
GN 412 Elementary Genetics Laboratory	1
MB 401 General Microbiology	4
SSC 200 Soil Science	4
ST 311 Introduction to Statistics	3
Three credit hours of 200 level or above course with the following abbreviations CS, FS, HS and PP or FW(ZO) 221 or FW(ZO) 353	3
Departmental Requirements and Electives (28 Credits)	
BO 200 Plant Life	4
BO (ZO) 360 Introduction to Ecology	3
BO (ZO) 365 Ecology Lab	1
BO 400 Plant Diversity	4
BO 403 Systematic Botany	4
BO 413 Introductory Plant Anatomy	4
BO 421 Plant Physiology	4
GN 411 The Principles of Genetics	4
Physical Education and Free Electives (16 Credits)	
PE 100 Health & Physical Fitness	1
Physical Education Electives	3
Free Electives	12
Minimum Hours Required for Graduation	131[2]

[1]The proposed program meets the minimum requirements for graduate work; however, additional courses are encouraged in mathematical and physical sciences for students who are planning advanced study. See adviser.

[2]Completion of one course in literature is required.

MINOR IN BOTANY

The 15 credit minor in Botany is offered to any undergraduate degree student interested in gaining a basic knowledge of plants. It is intended both to complement other curricula that are related to the plant sciences and to give students a basic appreciation of plants. Such appreciation includes an understanding of plant-human interactions, plant structure and how plants function, plant identification, and the pervasive roles of plants and plant products in human society. It is not intended to prepare students for a professional career in Botany, and additional courses are recommended for students who plan graduate work in the plant sciences.

CONSERVATION

(Also see Forest Resources.)

Williams (Room 2321) and Biltmore (Room 2028) Halls

Associate Professor H. J. Kleiss, *Major Adviser, College of Agriculture and Life Sciences*

Professor A. W. Cooper, *Major Adviser, College of Forest Resources*

Conservation is the wise use, perpetuation, or improvement of natural resources, for the long-time benefit of society. This baccalaureate degree program is offered jointly by the Colleges of Agriculture and Life Sciences and Forest Resources. Faculty members in several departments of the two colleges are directly involved in the varied aspects of natural resource management.

Rapid urbanization and industrialization concomitant with population growth and changes in lifestyles are bringing increased pressures on the use of land for providing food, water, fiber, wood and recreation. These trends present challenges to resource managers who must be well trained in the basic concepts of several disciplines in order to apply a conservation philosophy to many of our current resource problems.

CONSERVATION CURRICULUM

Students may enroll in either Agriculture and Life Sciences or Forest Resources, depending on their primary area of interest in conservation. The freshman common core of courses for either college is acceptable. All students take a prescribed core of subjects in conservation plus specified courses in one of five concentrations: soil conservation; environmental technology; environmental education; natural resource management and administration; communications. A dual degree program involving the conservation curriculum with another curriculum, e.g., science education, recreation, agronomy, forestry is very feasible and highly recommended.

SCIENCE PROGRAM

		Credits
ALS 103	Introductory Topics in ALS[1]	1
	Languages (12 Credits)	
ENG 111	Composition and Rhetoric	3
ENG 112	Composition and Reading	3
ENG 333	Commun. for Science & Res.	3
COM (SP) 110	Public Speaking	3
	Humanities and Social Sciences (21 Credits)	
EB 212	Econ. of Agriculture	3
PS 201	Introduction to American Government	3
	Literature Elective	3
	Electives	12
	Physical and Biological Sciences (28 Credits)	
BS 100	General Biology	4
CH 101	General Chemistry I	4
CH 103	General Chemistry II *or*	
CH 107	Principles of Chemistry	4
MA 111	Precalculus Algebra and Trigonometry	3
MA 121	Elements of Calculus *or*	
MA 131	Analytic Geometry and Calculus A	4
PY 221	College Physics	5
ZO 201	General Zoology *or*	
BO 200	Plant Life	4

Physical Education and Electives
(24 Credits)

PE 100 Health & Physical Fitness 1
Physical Education Electives 3
Free Electives 10

Departmental Requirements and Electives
(56 Credits)

BO (ZO) 360 Introduction to Ecology 3
BO (ZO) 365 Ecology Lab 1
FOR 262 Fundamentals of Forest Mgmt. 3
FOR 401 For. Hydro. & Watershed Mgmt. 4
FOR 472 Renew. Resource Pol. & Mgmt. 4
MEA 110 Physical Geology Lab 1
MEA 120 Elements of Physical Geology 2
RRA 241 Natural Resource Recreation *or*
RRA 350 Outdoor Recreation Management 3
SSC 200 Soil Science 4
ST 311 Introduction to Statistics 3
ZO (FW) 221 Conser. of Nat. Resources 3
ZO (FW) 353 Wildlife Management *or*
ZO (FW) 420 Fishery Science 3
Biological Science Electives 6
Conservation Electives 16

Minimum Hours Required for Graduation ... 131

SOIL CONSERVATION CONCENTRATION

PM 111 Integrated Pest Management 1
SSC (BAE) 323 Water Management 3
SSC 361 Non-Agri. Land Use & Management .. 3
SSC 452 Soil Classification 4
SSC 461 Soil Phy. Prop. & Plant Growth 3
SSC 492 Senior Seminar in Soil Science 1

15

ENVIRONMENTAL TECHNOLOGY CONCENTRATION[2]

BAE (CE) 578 Agricultural Waste Management[3] 3
FS (MB) 405 Food Microbiology 3
SSC 361 Non-Agricultural Land Use and Management 3
SSC 452 Soil Classification 4
ZO 419 Limnology 3

16

NATURAL RESOURCE MANAGEMENT AND ADMINISTRATION CONCENTRATION[4]

EB 307 Business Law I 3
EB 410 Public Finance 3
EB 436 Environmental Economics 3
FOR 491 Spec. Topics in For. & Related Nat. Resources .....(1-4) *or*
PS 491 Internship in Political Science *or*
SSC 490 Sr. Seminar in Soil Science 1
MEA 200 Intro. to the Marine Environment 3
PS 312 Introduction to Public Administration .. 3

16-19

ENVIRONMENTAL EDUCATION CONCENTRATION[5]

ED 203 Intro. to Teach. Math. & Sci. 3
ED 296D Special Topics in Science Education .. 1
ED 475 Methods of Teaching Science 3
Electives 9

16

COMMUNICATIONS CONCENTRATION[6]

ENG 214 Copyediting 3
ENG 215 Prin. of News Article Writing 3
COM (SP) 112 Basic Prin. of Interpersonal Comm. ... 3
COM (SP) 201 Theories of Persuasive Communication 3
COM (SP) 298 Special Proj. in Speech Commun. *or*
FOR 491 Spec. Topics in For. & Relat. Resources *or*
SSC 490 Senior Seminar in Soil Science 1-4
Elective 3

16-19

[1]For students enrolled in College of Agriculture and Life Sciences; students enrolled in College of Forest Resources not taking ALS 103 will increase free electives by one hour.
[2]MB 401 is a required biological sciences elective.
[3]or BAE (SSC) 321
[4]PS 202 and EB 301 are required Group D electives.
[5]PHI 304 is a required Group D elective.
[6]SOC 302 is a required Group D elective.

CROP SCIENCE

Williams Hall (Room 2210)

Professor J. C. Wynne, *Head of the Department*

Associate Professor J. M. DiPaola, *Undergraduate Coordinator*

TEACHING AND RESEARCH

Distinguished University Professor: M. M. Goodman

Alumni Distinguished Undergraduate Professors: D. A. Emery, W. T. Fike, Jr., R. P. Patterson

William Neal Reynolds Professors: M. M. Goodman, E. A. Wernsman

Professors: J. C. Burns (USDA), J. W. Burton (USDA), B. E. Caldwell, D. S. Chamblee, H. D. Coble, F. T. Corbin, H. D. Gross, S. C. Huber (USDA), R. C. Long, D. E. Moreland (USDA), H. Seltmann (USDA), H. T. Stalker, D. H. Timothy, J. B. Weber, W. W. Weeks, R. F. Wilson (USDA), A. D. Worsham; *Adjunct Professors:* D. G. Oblinger, D. T. Patterson, G. M. Werner; *Professors Emeriti:* C. A. Brim, J. F. Chaplin, W. A. Cope, D. U. Gerstel, W. B. Gilbert, W. C. Gregory, G. R. Gwynn, P. H. Harvey, G. C. Klingman, J. A. Lee, R. L. Lovvorn, R. P. Moore, L. L. Phillips, J. C. Rice, D. L. Thompson, J. A. Weybrew; *Associate Professors:* J. M. Anderson (USDA), D. T. Bowman, K. O. Burkey (USDA), T. E. Carter (USDA), D. A. Danehower, E. L. Fiscus (USDA), D. S. Fisher (USDA), T. G. Isleib, R. D. Keys, J. E. Miller (USDA), J. P. Murphy, C. H. Peacock, R. C. Rufty, T. W. Rufty, Jr. (USDA), G. G. Wilkerson; *Adjunct Associate Professor:* P. S. Zorner; *Assistant Professors:* S. H. Kay, P. Kwanyueh (USDA), M. G. Redinbaugh (USDA), S. M. Reed (USDA), P. H. Sisco (USDA), V. A. Sisson (USDA), A. K. Weissinger, R. Wells; *Associate Members of the Faculty:* S. M. Schneider (Biomathematics, Plant Pathology), T. J. Sheets (Entomology, Horticultural Science), C. T. Young (Food Science).

EXTENSION

Philip Morris Professors: W. K. Collins, G. F. Peedin

Professor W. K. Collins, *Associate Head & Specialist-in-Charge, Crop Science Extension*

Professors: E. J. Dunphy, J. T. Green, Jr., W. M. Lewis, F. W. McLaughlin, J. P. Mueller, G. A. Sullivan, A. C. York; *Professors Emeriti:* R. R. Bennett, C. T. Blake, S. H. Dobson, S. N. Hawks, G. L. Jones, A. Perry, A. D. Stuart; *Associate Professors:* J. R. Anderson, Jr., A. H. Bruneau, R. L. Davis, R. E. Jarrett, H. M. Linker, W. D. Smith; *Associate Professor Emeritus:* W. G. Toomey; *Assistant Professors:* J. M. Ferguson; *Extension Specialists:* D. W. Daniel, D. S. Guthrie, G. E. Martin, Jr., F. H. Yelverton.

Crop scientists seek to improve the productivity, profitability and quality of our major food, feed, and fiber crops; enhance the quality of our turf and vegetable cover, and improve the nutrient and economic health of our world. The Crop Science four-year undergraduate program is offered within the Agronomy curriculum and administered jointly by the Crop Science and Soil Science departments. Students may earn a Bachelor of Science degree under the technology curriculum with a major in Agronomy. See Agronomy curriculum.

CAREER OPPORTUNITIES

Agronomy major graduates find employment as consultants, extension agents, farm managers, golf course superintendents, landscape specialists, research scientists, seed production specialists, sod production specialists, soil survey specialists, soil conservationists, technical sales representatives, and waste management specialists. The Agronomy curriculum can be found in this catalog under College of Agriculture and Life Sciences. For Crop Science graduate programs, see the Graduate catalog.

UNDERGRADUATE CURRICULA

Students may earn a Bachelor of Science degree under the technology curriculum with a major in agronomy. The agronomy option is administered jointly by the Departments of Crop Science and Soil Science. See agronomy curriculum.

DAIRY SCIENCE

(See Animal Science.)

ENTOMOLOGY

Gardner Hall (Room 2301)

Professor J. D. Harper, *Head of the Department*

Professor J. R. Meyer, *Undergraduate Coordinator*

TEACHING AND RESEARCH

Alumni Distinguished Undergraduate Professor: C. G. Wright

Professors: R. C. Axtell, J. R. Bradley, Jr., W. M. Brooks, M. H. Farrier, F. L. Gould, F. P. Hain, G. G. Kennedy, R. J. Kuhr, H. H. Neumann, G. C. Rock, R. E. Stinner; *Adjunct Professor:* F. L. Hastings; *Professors Emeriti:* W. V. Campbell, K. L. Knight, W. J. Mistric, Jr., H. B. Moore, R. L. Rabb, C. F. Smith, D. A. Young; *Associate Professors:* L. L. Deitz, D. M. Jackson (USDA), E. P. Lampert, B. M. Parker, R. M. Roe; *Adjunct Associate Professor:* C. Y. Kawanishi; *Assistant Professors:* M. E. Barbercheck, D. W. Keever (USDA); *Adjunct Assistant Professor:* K. J. Giroux; *Research Associates:* S. P. Cook, M. E. Derrick, M. G. Fletcher, K. J. Patel, L. R. Wilhoit; *Teaching Technician:* M. T. Lassiter; *Associate Members of the Faculty:* W. C. Dauterman (Toxicology), B. C. Haning (Plant Pathology), H. M. Linker (Crop Science).

EXTENSION

Associate Professor P. S. Southern, *Specialist-in-Charge*

Philip Morris Professor: J. W. Van Duyn

Professors: J. T. Ambrose, C. S. Apperson, J. S. Bacheler, J. R. Baker, K. A. Sorensen; *Professors Emeriti:* G. D. Jones, R. L. Robertson; *Associate Professors:* J. J. Arends, R. L. Brandenberg, R. C. Hillman; *Assistant Professor:* J. F. Walgenbach; *Extension Specialists:* S. B. Bambara, D. L. Stephan, S. J. Toth, M. G. Waldvogel.

Undergraduate instruction in entomology is designed to provide introductory and advanced courses in the basic science of entomology and on the management of beneficial and pest insects. These courses serve students majoring in biological sciences, agronomy, horticultural science, agricultural education, and forestry. They also provide fundamental training for graduate study in entomology (See listing of graduate degrees).

OPPORTUNITIES

For graduates with advanced degrees in entomology, opportunities include research teaching, and extension positions in universities; research, development, production, control, and sales positions in private industries; consultative positions in pest management; and research and regulatory positions with state and federal agencies.

UNDERGRADUATE CURRICULUM

There is no entomology undergraduate major. Those students with a primary interest in entomology who plan to go on to graduate studies are advised to take the general biological sciences curriculum and develop a strong knowledge base in the basic biological sciences. Electives from entomology courses may be selected.

FISHERIES AND WILDLIFE SCIENCES

Gardner Hall (Room 2115)

Professor R. L. Noble, *Undergraduate Coordinator*

(See curriculum in Fisheries and Wildlife Sciences under Department of Zoology.)

FOOD SCIENCE

Schaub Food Science Building (Room 100)

Professor D. R. Lineback, *Head of the Department*

Professor V. A. Jones, *Undergraduate Coordinator*

TEACHING AND RESEARCH

William Neal Reynolds Professor: H. E. Swaisgood

Professors: H. R. Ball, Jr., D. E. Carroll, Jr., G. L. Catignani, Jr., H. P. Fleming (USDA), D. D. Hamann, H. M. Hassan, T. R. Klaenhammer, T. C. Lanier, R. F. McFeeters (USDA), J. L. Oblinger, K. R. Swartzel, L. G. Turner, W. M. Walter, Jr. (USDA), C. T. Young; *Adjunct Professors:* J. P. Adams, N. B. Webb; *Professors Emeriti:* L. W. Aurand, T. A. Bell, T. N. Blumer, H. B. Craig, M. W. Hoover, A. E. Purcell, W. M. Roberts, M. L. Speck, F. G. Warren; *Associate Professors:* E. A. Foegeding, P. M. Foegeding, A. P. Hansen, D. K. Larick, S. J. Schwartz, B. W. Sheldon; *Assistant Professors:* J. C. Allen, L. C. Boyd; *Research Associates:* D. K. Arora, H. Chen, G. S. Ganesan, A. Kumar, S. Oh, C. J. Soodeen; *Associate Members of Faculty:* H. R. Horton (Biochemistry); C. J. Lackey (Foods and Nutrition); H. E. Pattee (Botany); N. F. Tope (Foods and Nutrition).

EXTENSION

Associate Professor D. R. Ward, *Specialist In Charge*

Professors: R. E. Carawan, M. E. Gregory; *Professors Emeriti:* J. A. Christian, E. S. Cofer, I. D. Jones, N. C. Miller, Jr., F. R. Tarver, Jr., F. B. Thomas; *Associate Professors:* D. H. Pilkington, J. E. Rushing; *Specialist:* D. P. Green.

The Department of Food Science provides undergraduate and graduate programs for the application and integration of chemistry, biology, and engineering to the development, processing, packaging, quality control, distribution and utilization of foods. The department maintains modern fully-equipped laboratories for teaching and research in the disciplines of food microbiology, food chemistry/biochemistry, food engineering, and nutrition; and the product areas of dairy, fruit, meats, poultry, seafood, and vegetable products.

OPPORTUNITIES

Increasing consumer demands for greater varieties of nutritious and convenience foods of uniformly high quality create many varied career opportunities in the food and allied industries.

Career opportunities in food industries are: management, research and development, process supervision, quality control, procurement, distribution, sales and merchandising. Positions include sales and services in allied industries, consulting and trade association activities and promotional and educational services.

Food Science graduates hold teaching, research and extension positions with colleges and universities. Governmental agencies employ food scientists whose work is directed toward research, regulatory control and the development of food standards.

The food industry provides both merit and financial need scholarships to encourage students preparing for careers in food science. Phi Tau Sigma Honor Society invites outstanding seniors to membership, and all students are encouraged to participate in the Food Science Club, a student branch of the Institute of Food Technologists.

CURRICULA IN FOOD SCIENCE

The Bachelor of Science degree with a major in food science is offered through curricula with a science emphasis or a technology emphasis. The science program is designed for students with interest in graduate school or for those desiring more rigorous science courses for technical careers in the food industry. Students more interested in business opportunities for technically trained individuals find the technology program permits greater flexibility in complementing food science coursework with business and agricultural commodity courses.

See listing of graduate degrees offered.

SCIENCE PROGRAM

	Credits
ALS 103 Introductory Topics in ALS	1
Languages (12 Credits)	
ENG 111 Composition and Rhetoric	3
[illegible]	3
[illegible]	6
Humanities and Social Sciences (21 Credits)	
[illegible]	21
Mathematics and Statistics (13 Credits)	
MA 111 Precalculus Algebra & Trigonometry	3
MA 131 Analytic Geometry & Calc. A	4
MA 231 Analytic Geometry & Calc. B	3
ST 311 Introduction to Statistics	3
Chemistry (14 Credits)	
BCH 451 Elementary Biochemistry	3
CH 101 General Chemistry I	4
CH 107 Principles of Chemistry	4
CH 221 Organic Chemistry I	4
CH 223 Organic Chemistry II	4
Biological Sciences (8 Credits)	
BS 100 General Biology	4
MB 401 General Microbiology	4
Physics (8 Credits)	
PY 211 College Physics I	4
PY 212 College Physics II	4
Food Science (31 Credits)	
FS 201 Food Science and the Consumer	3
FS 331 Food Engineering	3
FS 400 Principles of Human Nutrition	3
FS 402 Food Chemistry	3
FS 403 Food Analysis	3
FS (MB) 405 Food Microbiology	3
FS 421 Food Preservation	3
FS (ANS, PO) 322 Muscle Foods and Eggs *or*	
FS (ANS) 324 Milk & Dairy Products *or*	
FS 423 Muscle Food Technology *or*	
FS 425 Processing Dairy Products	3
FS 490 Food Science Seminar	1
Food Science Electives	6
Physical Education and Free Electives (17 Credits)	
PE 100 Health & Physical Fitness	1
Physical Education Electives	3
Free Electives	13
Minimum Hours Required for Graduation	130

Any English, foreign language or communication course may be used as language elective. A literature course or 200-level foreign language course must be included in the curriculum.

TECHNOLOGY PROGRAM

	Credits
ALS 103 Introductory Topics in ALS	1
Languages (12 Credits)	
ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
COM (SP) 110 Public Speaking	3
Literature Elective	3
Humanities and Social Sciences (21 Credits)	
Electives	21
Mathematics (10 Credits)	
MA 111 Precalculus Algebra and Trigonometry	3
MA 114 Intro. to Finite Math. Appl. *or*	
MA 231 Analytic Geometry & Calc. B	3
MA 121 Elements of Calculus *or*	
MA 131 Analytic Geometry & Calc. A	4
Chemistry (12-16 Credits)	
CH 101 General Chemistry I	4
CH 103 General Chemistry II *or*	
CH 107 Principles of Chemistry	4
CH 220 Introduction to Organic Chemistry *or*	
CH 221 Organic Chemistry I and	
CH 223 Organic Chemistry II	4-8
Biological Sciences (8 Credits)	
BS 100 [illegible]	4
MB 401 General Microbiology	4
Physics (5 Credits)	
PY 221 College Physics	5
Groups A, B, C Electives (10-17 Credits)[1]	
Electives	10-17
Food Science (27 Credits)	
FS 201 Food Science & the Consumer	3
FS 331 Food Engineering	3
FS 402 Food Chemistry	3
FS 403 Food Analysis	3
FS (MB) 405 Food Microbiology	3
FS 416 Quality Control of Food Products	3
FS 421 Food Preservation	3
FS 490 Food Science Seminar	1
Food Science Elective	2
Food Processing Elective (FS 322, 324, 423 or 425)	3
Physical Education and Free Electives (17 Credits)	
PE 100 Health & Physical Fitness	1
Physical Education Electives	3
Free Electives	13
Minimum Hours Required for Graduation	130

[1]Dependent on whether CH 220 or CH 221-223 and PY 221 or PY 211-212 are elected.

MINOR IN FOOD SCIENCE

The minor in Food Science is designed to provide important food science principles and concepts to students seeking to improve their understanding of food and its manufacture and, especially, to those seeking employment as chemists, microbiologists, engineers, nutritionists, business specialists, or technical writers in the food and pharmaceutical industry. One introductory course (FS 201) is required, and 12 additional hours at the 300 or 400 level may be selected to complement a variety of majors.

GENETICS

Gardner Hall (Room 3513)

Professor D. F. Matzinger, *Interim Department Head*

Professor W. H. McKenzie, *Undergraduate Coordinator*

Distinguished University Professor and William Neal Reynolds Professor: C. S. Levings

Distinguished University Professor: J. G. Scandalios

Alumni Distinguished Undergraduate Professor: W. H. McKenzie

Professors: W. R. Atchley, W. D. Hanson, W. E. Kloos, R. H. Moll, G. Namkoong (USFS), C. W. Stuber (USDA), A. C. Triantaphyllou; *Adjunct Professor:* M. D. Chilton; *Professors Emeriti:* C. H. Bostian, D. S. Grosch, T. J. Mann, L. E. Mettler; *Associate Professors:* S. E. Curtis, T. H. Emigh, T. F. C. Mackay, S. L. Spiker; *Assistant Professors:* M. T. Andrews, M. A. Conkling, J. W. Mahaffey; *Research Associates:* R. E. Cannon, D. E. Cowley, R. F. Lyman, M. E. Williams, J. D. Williamson; *Associate Members of the Faculty:* H. E. Schaffer (Academic Computing), E. J. Eisen, C. L. Markert, B. T. McDaniel, R. M. Petters, O. W. Robison (Animal Science); F. B. Armstrong (Biochemistry); R. S. Boston, W. F. Thompson (Botany); E. A. Wernsman, (Crop Science); M. M. Goodman (Crop Science, Statistics, Botany); D. H. Timothy (Crop Science); C. C. Cockerham, J. O. Rawlings, B. S. Weir (Statistics); R. R. Sederoff (Biochemistry, Forestry); K. G. Tatchell (Microbiology); J. L. Apple (Plant Pathology).

The genetics faculty offers instruction at advanced undergraduate and graduate levels. The undergraduate courses are designed to support other departments, giving students a background in genetics. Since there is no genetics baccalaureate program, interested undergraduates are encouraged to pursue a biological sciences program. The graduate program is designed to train scientists for research and teaching careers in basic genetics and in its application in plant and animal breeding. See listing of graduate degrees offered.

MINOR IN GENETICS

The academic minor in Genetics is intended to provide the undergraduate student with a strong preparation in the principles of genetics in order to complement their academic major. This minor is appropriate for (but not limited to) students with majors in Animal Science, Biochemistry, Botany, Conservation, Crop Science, Fisheries and Wildlife Sciences, Horticultural Science, Microbiology, Poultry Science and Zoology. Ten hours of required courses and 6 hours of electives are necessary to complete the minor.

HORTICULTURAL SCIENCE

Kilgore Hall (Room 114)

Professor T. J. Monaco, *Head of the Department*

Lecturer B. H. Lane, *Undergraduate Coordinator*

TEACHING AND RESEARCH

Alumni Distinguished Undergraduate Professor: B. H. Lane

Professors: J. R. Ballington, Jr., F. A. Blazich, W. W. Collins, A. A. De Hertogh, P. R. Fantz, R. A. Larson, P. V. Nelson, D. M. Pharr, J. C. Raulston, C. R. Unrath, T. C. Wehner, D. J. Werner, E. Young; *Adjunct Professors:* P. L. Accatino (Peru), D. T. Patterson (Duke University), R. L. Sawyer (Peru); *Professors Emeriti:* W. E. Ballinger, F. D. Cochran, F. L. Haynes, Jr., J. M. Jenkins, T. R. Konsler, C. H. Miller, D. T. Pope; *Associate Professors:* T. E. Bilderback, S. M. Blankenship, W. C. Fonteno, R. G. Gardner, W. R. Henderson, L. E. Hinesley, W. E. Hooker, M. M. Peet; *Adjunct Associate Professor:* P. S. Zorner (Mycogen Corp.); *Adjunct Associate Professor:* D. R. Carlson; *Associate Professor Emeritus:* D. C. Zeiger; *Assistant Professors:* J. D. Burton, J. M. Davis, T. G. Ranney, S. L. Warren; *Lecturer:* M. E. Trader; *Research Associates:* N. L. Hubbard, W. K. Kroen, M. J. Wannamaker; *Associate Members of the Faculty:* D. E. Carroll, Jr. (Food Science), R. J. Downs, R. L. Mott (Botany), R. H. Moll (Genetics), T. J. Sheets (Toxicology, Crop Science), R. J. Volk (Soil Science).

EXTENSION

Professor M. A. Powell, Jr., *Extension Specialist, In Charge*

Professors: C. M. Mainland, D. C. Sanders, W. A. Skroch, J. H. Wilson, Jr., L. G. Wilson; *Professors Emeriti:* A. A. Banadyga, J. F. Brooks, Jr., H. M. Covington, J. H. Harris, G. R. Hughes, M. H. Kolbe, J. W. Love; *Associate Professors:* K. B. Perry, E. B. Poling; *Associate Professors Emeriti:* T. F. Cannon, W. W. Reid; *Assistant Professors:* D. A. Bailey, D. W. Monks, M. L. Parker, J. R. Schultheis; *Extension Specialists:* L. Bass, R. E. Bir, G. L. Johnson.

Horticulture is a dynamic segment of agriculture. The development, growth, distribution, and utilization of fruits, vegetables, flowers and ornamental plants plus the arts of floral design and landscaping enrich our lives with nutritious foods and more attractive surroundings. North Carolina's varied climatic conditions favor the production of a wide variety of horticultural crops on a commercial scale as well as the development of parks and gardens. The population and amount of industry in the state are increasing, and with them the use of ornamental plants. Designers skilled in residential and commercial landscaping, interior plantscaping, and plant maintenance are in demand. All this in turn has created a growth in interest in horticulture education.

Undergraduate programs in horticultural science offer a broad based education in physical and biological sciences and a sound cultural background. Students can concentrate in areas of fruit and vegetable science, floriculture, woody ornamental plant science, landscape horticulture, or pursue a general approach which encompasses all the specialties. They are prepared for graduate study or for diverse professional service.

OPPORTUNITIES

Horticulture graduates fill positions in production, processing, sales and service. Among these are county extension agents; vocational agricultural teachers; landscapers and landscape contractors; farm operators; orchard, nursery, greenhouse and flower shop managers; research, production and promotional specialists with commercial seed, floral, fertilizer, chemical and food companies; inspectors and quality control technologists; USDA specialists and as leaders in other phases of agricultural and industrial developments. The student may also prepare for a career in research, teaching, extension, etc. in horticulture.

CURRICULA IN HORTICULTURAL SCIENCE

The degree of Bachelor of Science with a major in horticultural science can be earned in either science or technology—offered by the College of Agriculture and Life Sciences. Under the science curriculum, specialized education is offered in fruit and vegetable crops,

floriculture, and ornamental horticulture. Under the technology curriculum, education is offered in landscape horticulture, or in a general approach which includes all the commodity areas.

TECHNOLOGY PROGRAM

	Credits
ALS 103 Introductory Topics in ALS	1
Languages (12 Credits)	
ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
COM (SP) 110 Public Speaking	3
Literature Elective	3
Humanities and Social Sciences Group D (21 Credits)	
Electives (Incl. EB 212)	21
Physical and Biological Sciences (31-32 Credits)	
BO 200 Plant Life	4
BS 100 General Biology	4
CH 101 General Chemistry I	4
CH 103 General Chemistry II	4
MA 111 Precalculus Algebra and Trigonometry	3
MA 114 Intro. to Finite Math. Appl. *or*	
MA 121 Elements of Calculus, *or*	
MA 131 Analytic Geometry & Calc. A	4-3
PY 221 College Physics	5
SSC 200 Soil Science	4
Physical Education And Free Electives (16-17 Credits)	
PE 100 Health & Physical Fitness	1
Physical Education Electives	3
Free Electives	12-13[2]
Group A and C Courses[1] (21 Credits)	
BO 421 Plant Physiology	4
ENT 312 Intro. to Economic Entomology	3
ENT 425 General Entomology (HG)	3
HS 201 Principles of Horticulture	3
HS 301 Plant Propagation (FL,FV,HG,OH)	4
HS 411 Nursery Management (HG,LH)	3
HS 440 Greenhouse Management (HG)	3
HS 441 Floriculture I (FL)	3
HS 471 Tree & Grounds Maintenance (LH)	4
PP 315 Plant Diseases	4
SSC 341 Soil Fertility & Fertilizers (FV,OH)	3
Departmental Requirements and Electives (26-34 Credits)	
GN 301 Genetics in Human Affairs *or*	
GN 411 Principles of Genetics (FL,FV,HG,OH)	3-4[2]
HS 211 Ornamental Plants (LH,OH) (HG *or*)	3
HS 212 Ornamental Plants II (FL,HG,LH,OH)	3
HS 342 Landscape Horticulture (LH,OH)	3
HS 400 Residential Landscape (LH)	6
HS 411 Nursery Management (OH)	3
HS 416 Princ. Ornamental Plant Design *or*	
DN 433 Native Plants in Environ. Design (LH)	3
HS 421 Tree Fruit Production (FV) (HG *or*)	3
HS 422 Small Fruit Production (FV,HG)	3
HS 431 Vegetable Production (HG,FV)	4
HS 440 Greenhouse Management (FL)	3
HS 442 Floriculture II (FL,HG)	3
HS 471 Tree and Grounds Maintenance (HG,OH)	4
HS 490 Horticultural Science Seminar	1
HS (FS) 462 Postharvest Physiology (HG)	3
LAR 234 Intro. to Environmental Design (LH)	3
LAR 400 Intermed. Landscape Arch. Desg. (LH)	6
LAR 430 Site Planning (LH)	3
LAR 457 Landsc. Mat'ls. & Construct. I (LH)	3
EB or ACC Elective (FL,FV,OH)	6
Departmental Electives (FL 7-8) (FV-3-4) (OH-1)	
HG—Select one 3 cr. course from the following:	
HS 211 Ornamental Plants I	
HS 212 Ornamental Plants II	
HS 342 Landscape Horticulture	
HS 371 Interior Plantscapes	
HS 421 Tree Fruit Production	
HS 422 Small Fruit Production	
HS 441 Floriculture I	
HS 531 Physiology of Landscape Plants	
Minimum Hours Required for Graduation	130[3]

[1]Students entering the curriculum after spring 1990 may choose from either HG-General Horticulture or LH-Landscape Horticulture. The concentrations FV-Fruits & Vegetables, FL-Floriculture, and OH-Ornamental are being phased out through 1/95.
[2]Students choosing GN 411 (4) over GN 301 (3) have a free elective requirement of 12 hrs. instead of 13 hrs.
[3]Hours Required for Graduation in LH are 137.

SCIENCE PROGRAM

	Credits
ALS 103 Introductory Topics in ALS	1
Languages (12 Credits)	
ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
COM (SP) 110 Public Speaking	3
Literature Elective/Foreign Language	3
Humanities and Social Sciences— Group D (21 Credits)	
Electives (Incl. EB 212)	21

Physical and Biological Sciences
(26 Credits)

BO 200 Plant Life 4
[illegible] 4
[illegible] 4
[illegible] 4
MA 111 Precalculus Algebra and Trigonometry .. 3
MA 131 Analytic Geometry & Calc. A 4
PY 221 [illegible] 5

Physical Education and Free Electives
(16 Credits)

PE 100 Health & Physical Fitness 1
Physical Education Electives 3
Free Electives 12

Group A and C Courses
(26 Credits)

BCH 451 Introductory Biochemistry 3
BO 421 Plant Physiology 4
CH 221, 223 Organic Chemistry I, II 8
ENT 312 Intro. to Economic Entomology 3
PP 315 Principles of Plant Pathology 4
SSC 200 Soil Science 4

Departmental Requirements and Electives
(26 Credits)

GN 411 The Principles of Genetics 4
GN 412 Genetics Lab 1
HS 201 Principles of Horticulture 3
HS 211 Ornamental Plants I (OH) 3
HS 212 Ornamental Plants II (OH,FL) 3
HS 301 Plant Propagation (OH,FL) 4
HS 411 Nursery Management (OH) 3
HS 421 Tree Fruit Production (FV) 3
HS 422 Small Fruit Production (FV) 3
HS 431 Vegetable Production (FV) 4
HS 440 Greenhouse Management (FL) 3
HS 441 Floriculture I (FL) 3
HS 442 Floriculture II (FL) 3
HS 471 Tree and Grounds Maintenance (OH) 4
HS 490 Hort. Science Seminar 1
HS (FS) 462 Post Harvest Physiology (FV) 3
Departmental Elective (FV-4) (FL-1) .....variable

Minimum Hours Required for Graduation ... 130

FV—Fruits and Vegetables, OH—Ornamentals, FL—Floriculture

MINOR IN HORTICULTURAL SCIENCE

The academic minor in Horticultural Science is offered to students who desire a strong foundation in the principles of horticultural science. Students may choose to enhance their own major by selecting courses in a specialized area of horticulture such as fruits and vegetables, ornamentals, floriculture, or landscape horticulture, or they may pursue a more general approach to the entire field of study.

INDIVIDUALIZED STUDY PROGRAM

Patterson Hall (Room 115)

Professor J. L. Oblinger, *Associate Dean and Director of Academic Affairs*

The individualized study program entails a curriculum planned by the student with the assistance of a faculty advisory committee. Interested students are requested to follow details of the program through the Director of Academic Affairs, 115 Patterson Hall.

MEDICAL TECHNOLOGY

Gardner Hall (Room 1627)

Professor G. C. Miller, *Undergraduate Coordinator*

(See Science Program in Medical Technology under Department of Zoology.)

MICROBIOLOGY

Gardner Hall (Room 4515)

Professor L. W. Parks, *Head of the Department*

Associate Professor G. H. Luginbuhl, *Undergraduate Coordinator*

Professors: P. E. Bishop (USDA), W. J. Dobrogosz, G. H. Elkan, J. J. Perry; *Adjunct Professors:* C. R. Bunn, W. R. Finnerty, R. E. Kanich; *Associate Professors:* J. M. McKenzie, Jr., T. Melton, K. G. Tatchell; *Adjunct Associate Professor:* K. T. Kleeman; *Assistant Professors:* S. M. Laster, E. S. Miller; *Adjunct Assistant Professor:* W. S. Dallas, S. H. Shore; *Research Associates:* J. N. Lee, R. T. Lorenz, S. Thompson-Jaeger; *Teaching Technicians:* V. M. Knowlton, C. S. Richter; *Associate Members of the Faculty:* J. C. Leece (Animal Science); P. M. Foegeding, H. M. Hassan, T. R. Klaenhammer (Food Science); W. E. Kloos (Genetics); P. B. Hamilton (Poultry Science); F. J. Fuller (Veterinary Medicine).

The microbiology program provides basic preparation for professional microbiologists, a microbiology background for students in other sciences, and an awareness of the microbial world as it relates to our daily lives for non-science majors.

Microbiology is concerned with the growth and development, physiology, classification, ecology, genetics and other aspects of the life processes of an array of microscopic, generally single-celled, organisms. These organisms frequently serve as model systems for elucidation of fundamental processes that are common to all living cells. Most of the major discoveries that have produced the spectacular advances in biology during the past decade have resulted from studies of microbial systems. Future developments in biotechnology, production of food and fuel, and human health, will rely heavily on understanding microbial processes.

OPPORTUNITIES

Microbiologists are employed in university, governmental and industrial research laboratories, diagnostic and control laboratories, teaching, and technical sales and service positions.

CURRICULUM

There is a microbiology option under the biological sciences curriculum. (See curriculum under biological sciences.) This requires three courses (9 credits) in microbiology in addition to MB 401, which is part of the basic biological sciences requirement. (See listing of graduate degree programs.)

PLANT PATHOLOGY

Gardner Hall (Room 2518)

Professor L. F. Grand, *Interim Head of the Department and Undergraduate Coordinator*

TEACHING AND RESEARCH

University Distinguished Scholar: A. Kelman

Professors: J. L. Apple, K. R. Barker, D. F. Bateman, D. M. Benson, M. K. Beute, J. M. Davis, E. Echandi, G. V. Gooding, Jr., A. S. Heagle (USDA), J. S. Huang, W. L. Klarman, L. T. Lucas, C. E. Main, R. D. Milholland, J. W. Moyer, G. A. Payne, R. A. Reinert (USDA), H. W. Spurr, Jr. (USDA), T. B. Sutton, H. H. Triantaphyllou; *Professors Emeriti:* R. Aycock, C. N. Clayton, D. E. Ellis, T. T. Hebert, G. B. Lucas, J. P. Ross, J. N. Sasser, D. L. Strider, F. L. Wellman, N. N. Winstead; *Associate Professors:* R. I. Bruck, C. L. Campbell, M. L. Carson (USDA), M. E. Daub, B. C. Haning, H. D. Shew; *Assistant Professors:* V. J. Elliott (USDA), S. Leath (USDA), P. B. Lindgren, S. A. Lommel, C. H. Opperman, J. B. Ristaino, S. M. Schneider (USDA), S. R. Shafer (USDA), R. G. Upchurch (USDA); *Adjunct Assistant Professors:* J. L. Imbriani (NCDA), S. Spencer (NCDA); *Research Associates:* K. L. Everts (USDA), D. A. Neher, L. A. Urban, K. Verma, Z. Xiong, K. Zagula; *Associate Members of the Faculty:* C. G. VanDyke (Botany), R. C. Rufty (Crop Science), E. B. Cowling, M. P. Levi (Forestry), C. B. Davey (Forestry, Soil Science), J. H. Wilson, Jr. (Horticulture), W. M. Hagler, Jr. (Animal Science, Poultry Science).

EXTENSION

Professor R. K. Jones, *In Charge*

Professors: C. W. Averre, III, H. E. Duncan, P. B. Shoemaker; *Professors Emeriti:* N. T. Powell, F. A. Todd, J. C. Wells; *Associate Professors:* J. E. Bailey, D. F. Ritchie; *Assistant Professor:* T. A. Melton, III; *Research/Extension Specialist:* W. O. Cline.

Undergraduate instruction in plant pathology is designed to provide introductory and advanced courses on the nature and control of plant diseases to students majoring in crop science, horticultural science, agricultural education and forestry. It also provides fundamental training necessary for graduate study in plant pathology.

The Department of Plant Pathology does not offer an undergraduate major in plant pathology. (See listing of graduate degrees offered.)

OPPORTUNITIES

Employment in research, extension and teaching is available to graduates with advanced degrees in plant pathology. Research openings are with the U. S. Department of Agriculture, state experiment stations and in industry. The rapid development of agricultural chemicals and other methods for disease control offers numerous opportunities.

POULTRY SCIENCE

Scott Hall (Room 120)

Professor G. B. Havenstein, *Head of the Department*

Assistant Professor S. L. Pardue, *Undergraduate Coordinator*

TEACHING AND RESEARCH

Alumni Distinguished Undergraduate Professor: C. R. Parkhurst

William Neal Reynolds Professors: C. H. Hill, W. E. Donaldson

Professors: J. T. Brake, V. L. Christensen, R. E. Cook, F. W. Edens, J. D. Garlich, W. M. Hagler, Jr., P. B. Hamilton, J. F. Ort, J. C. H. Shih, T. D. Siopes; *Adjunct Professors:* K. K. Krueger, K. N. May, D. I. McRee, J. P. Thaxton; *Professor Emeriti:* E. W. Glazener; *Adjunct Associate Professor:* N. Chernoff, C. A. Ricks, J. K. Tyczkowski; *Assistant Professors:* J. N. Petitte, M. A. Qureshi; *Adjunct Assistant Professors:* T. L. Fredericksen, R. P. Gildersleeve, J. W. Laskey; *Research Associate:* E. S. Casale; *Associate Members of the Faculty:* W. J. Croom, Jr. (Animal Science), H. R. Ball, Jr., B. W. Sheldon (Food Science), D. P. Wages (College of Veterinary Medicine).

EXTENSION

Professor T. A. Carter, *In Charge*

Professor: F. T. Jones; *Professors Emeriti:* W. G. Andrews, J. R. Harris, G. A. Martin, W. C. Mills, Jr., T. B. Morris; *Associate Professor:* M. J. Wineland; *Assistant Professors:* K. E. Anderson, P. R. Ferket, D. V. Rives, S. E. Scheideler; *Assistant Professor Emeritus:* J. R. West; *Extension Specialists:* C. E. Brewer, G. S. Davis.

The Department of Poultry Science provides instruction in the principles of vertically integrated poultry production and in such related fields as nutrition, physiology, genetics, toxicology and biotechnology. Through teaching, research and extension, the department serves students, poultry producers and allied industries. Poultry production has increased rapidly during the last two decades and ranks first in North Carolina as a source of agricultural income. North Carolina ranks third nationally in the production of poultry products; the climatic and economic conditions in the state provide a sound base for continued expansion.

OPPORTUNITIES

The change from small-farm operations to large commercial poultry enterprises has created more specialized positions than there are available poultry graduates. Production-

oriented positions and off-the-farm operations in activities such as processing and distribution offer new job opportunities. The allied industries—feed, equipment, financing, pharmaceutical and other supplies—need more employees trained in poultry science. Graduates hold positions as managers and field representatives for businesses identified with, or serving the poultry industry. Graduates are also employed in communication and public relations and as teachers and extension and research specialists. Some graduates have their own poultry businesses.

CURRICULA IN POULTRY SCIENCE

Students desiring the Bachelor of Science with a major in poultry science may choose either the science or technology curriculum offered by the Department of Poultry Science. (See listing of graduate degrees.) One may obtain a double major in certain other curricula through careful use of electives and/or summer school attendance. The student should consult the undergraduate advisers in the department(s) concerned. Currently, the pre-veterinary science student may utilize all requirements toward a Bachelor of Science degree in the science option.

See the freshman year and basic requirements for College of Agriculture and Life Sciences.

SCIENCE PROGRAM

This curriculum is for the student interested in the basic biological and physical sciences. The student is better prepared for advanced study in various disciplines such as genetics, nutrition, physiology and pathology. Several pre-veterinary students are currently enrolled in this curriculum and are seeking a Bachelor of Science degree in poultry science. (See Pre-Professional Program in Veterinary Medicine).

	Credits
ALS 103 Introductory Topics in ALS	1
Languages (12 Credits)	
ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
COM (SP) 110 Public Speaking	3
Literature Elective	3
Humanities and Social Sciences (21 Credits)	
Electives	21
Physical and Biological Sciences (27-31 Credits)	
BS 100 General Biology	4
CH 101 General Chemistry I	4
CH 107 Principles of Chemistry	4
MA 111 Precalculus Algebra and Trigonometry	3
MA 114 Intro. to Finite Mathematics *or*	
MA 121 Elements of Calculus *or*	
MA 131 Analytic Geometry & Cal. A *or*	
MA 141 Analytic Geometry & Calc. I	3-4
MB 401 General Microbiology	4
PY 211-212 College Physics I, II *or*	
PY 221 College Physics	8-5
Physical Education and Free Electives (17 Credits)	
PE 100 Health & Physical Fitness	1
Physical Education Electives	3
Free Electives	13

Group A, B, C Courses (22-26 Credits)	
CH 221 Organic Chemistry I	4
CH 223 Organic Chemistry	4
EB 306 Agricultural Law, *or*	
EB 307 Business Law I *or*	
EB 326 Human Resource Management *or*	
ACC 280 Managerial Accounting	3
GN 411 Principles of Genetics	4
Group A Electives (Biological Science)	4
Group A Electives	0-4
Group B or C Electives	3
Departmental Requirements and Electives (26 Credits)	
PO 201 Poultry Science and Production	4
PO (ANS, FS) 322 Muscle Foods and Eggs	3
PO 405 Avian Physiology	4
PO (ANS, NTR) 415 Comparative Nutrition	3
PO 490 Poultry Seminar	1
PO (GN) 520 Poultry Breeding	3
PO (ZO) 524 Comparative Endocrinology	4
VMF 401 Poultry Diseases	4
Minimum Hours Required for Graduation	130

TECHNOLOGY PROGRAM

The technology curriculum in poultry science is designed to prepare students for direct entry into the poultry industry upon graduation; allows a greater selection of courses in the applied science and technology areas; and offers a student both basic and applied knowledge in poultry production which can be used directly in a family poultry operation upon graduation.

	Credits
ALS 103 Introductory Topics in ALS	1
Language (12 Credits)	
ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
COM (SP) 110 Public Speaking	3
Literature Elective	3
Humanities and Social Sciences (21 Credits)	
Electives	21
Physical and Biological Sciences (31-35 Credits)	
BS 100 General Biology	4
CH 101 General Chemistry I	4
CH 103 General Chemistry II *or*	
CH 107 Principles of Chemistry	4
MA 111 Precalculus Algebra and Trigonometry	3
MA 114 Intro. to Finite Mathematics *or*	
MA 121 Elements of Calculus *or*	
MA 131 Analytical Geometry & Calc. A	3-4
MB 401 General Microbiology	4
PY 211-212 College Physics I, II or	
PY 221 College Physics	5-8
Elective in Group A (Biological Science)	4
Physical Education and Free Electives (17 Credits)	
PE 100 Health and Physical Fitness	1
Physical Education Electives	3
Free Electives	13

Group A, B, C Courses (16-20 Credits)	
CH 220 Introductory Organic Chemistry *or*	
CH 221 Organic Chemistry I	4
EB 306 Agricultural Law *or*	
EB 307 Business Law I *or*	
EB 326 Human Resource Management *or*	
ACC 280 Managerial Accounting	3
GN 411 The Principles of Genetics	4
Electives in A, B, or C Courses	5-9
Departmental Requirements and Electives (28 Credits)	
PO 201 Poultry Science and Production	4
PO 301 Evaluation of Live Poultry	2
PO (ANS, FS) 322 Muscle Foods and Eggs	3
PO 405 Avian Physiology	4
PO (ANS, NTR) 415 Comparative Nutrition	3
VMF 401 Poultry Diseases	4
Select a minimum of two courses from:	4
PO 420 Turkey Production (2)	
PO 421 Commercial Egg Production (2)	
PO 422 Incubation and Hatchery Management (2)	
PO 423 Broiler Production (2)	
PO 490 Poultry Seminar	1
PO (GN) 520 Poultry Breeding	3
Minimum Hours Required for Graduation	130

PREMEDICAL SCIENCES

Premedical, predental, preoptometry, prepharmacy, preveterinary, and other allied health preprofessional programs are offered as foundation courses in several curricular tracks with emphasis on the physical and biological sciences. Requirements for most premedical sciences are similar. A number of students are accepted each year in leading medical colleges; several have received outstanding scholarships.

For the premedical, predental, and preoptometry programs, see zoology, biochemistry and the biological sciences curricula and consult Dr. William C. Grant, 111 Patterson Hall, Chairman of the University Preprofessional Health Science Committee.

SOCIOLOGY, ANTHROPOLOGY AND SOCIAL WORK

(Also see Humanities and Social Sciences)

1911 Building (Room 301)

Professor L. B. Otto, *Head of the Department*

Professor W. B. Clifford, *Associate Head, CALS Teaching and Research*

Associate Professor M. P. Atkinson, *Associate Head, CHASS Teaching and Research*

Associate Professor A. C. Davis, *Undergraduate Coordinator (Applied Sociology)*

Professor E. M. Crawford, *Graduate Administrator*

Associate Professor G. D. Hill, *Undergraduate Administrator*

SOCIOLOGY TEACHING AND RESEARCH

Professors: L. R. Della Fave, V. A. Hiday, R. L. Moxley, M. M. Sawhney, M. D. Schulman, R. C. Wimberley; *Adjunct Professor:* R. D. Mustian; *Professors Emeriti:* J. N. Collins, L. W. Drabick, C. P. Marsh, J. N. Young; *Associate Professors:* R. C. Brisson, F. R. Czaja, G. D. Hill, J. C. Leiter, R. J. Thomson, M. S. Thompson, D. T. Tomaskovic-Devey, K. M. Troost, E. M. Woodrum, M. T. Zingraff; *Assistant Professors:* P. L. McCall, M. L. Schwalbe, A. E. Thompson, C. R. Zimmer; *Assistant Professors Emeriti:* C. G. Dawson, T. M. Hyman; *Associate Member of the Faculty:* R. D. Mustian (Adult and Community College Education).

SOCIOLOGY EXTENSION

Associate Professor S. K. Garber, *Specialist in Charge*

Professors: V. C. Hamilton, T. N. Hobgood, Jr.; *Professors Emeriti:* P. P. Thompson, M. E. Voland; *Associate Professors:* S. K. Garber, S. C. Lilley; *Assistant Professor:* T. J. Hoban.

ANTHROPOLOGY TEACHING AND RESEARCH

Associate Professor J. M. Wallace, *Coordinator*

Associate Professors: G. S. Nickerson, I. Rovner, M. L. Walek; *Associate Professor Emeritus:* J. G. Peck; *Assistant Professor:* R. S. Ellovich.

SOCIAL WORK TEACHING AND RESEARCH

Associate Professor W. C. Peebles-Wilkins, *Director*

Professor: R. N. Reid; *Associate Professor:* W. C. Peebles-Wilkins; *Associate Professor Emeritus:* I. E. Russell; *Assistant Professors:* J. S. Brown, L. A. Smith; *Lecturer:* L. R. Williams.

This department teaches students the principles and techniques for understanding human group behavior. Most specifically the department seeks: (1) to educate students to understand communities and organizations and the people who live and work within them; (2) to qualify exceptional students at the undergraduate and graduate level for sociological research, teaching, and extension careers; (3) to solve problems in human group relations. Applied sociology is good training for a wide variety of careers. It is useful for any job which involves work with people, organizations or communities. It is also good preparation for professional careers in local government, personnel relations, law, the clergy, business and management.

CURRICULUM IN APPLIED SOCIOLOGY

The degree of Bachelor of Science with a major in applied sociology is offered under the science curriculum of the College of Agriculture and Life Sciences. In addition to topics in agricultural and community sociology, majors in this department have the option of concentrating in criminal justice.

SCIENCE PROGRAM

	Credits
ALS 103 Introductory Topics in ALS	1
Languages (12 Credits)	
ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
Language or Literature Elective	6
Humanities and Social Sciences (21 Credits)	
ANT 252 Cultural Anthropology	3
EB 201 Economics I *or*	
EB 212 Economics of Agriculture	3
PS 201 Introduction to American Government *or*	
PS 202 State and Local Government	3
SOC 202 Principles of Sociology	3
Electives (Six hours must come from Humanities—Group D. Area I Discipline)	9
Physical and Biological Sciences (29 Credits)	
BS 100 General Biology *or*	
BS 105 Biology in the Modern World	4
CH 101 General Chemistry I *or*	
CH 111 Foundations of Chemistry	4
CSC 200 Intro. to Computers and Their Uses *or*	
CSC Elective	3
MA 111 Precalculus Algebra and Trigonometry	3
MA 131 Analytic Geometry & Calc. A *or*	
MA 141 Analytic Geometry and Calculus I	4
PY 221 College Physics	5
ST 311 Introduction to Statistics	3
Physical or Biological Science Elective	3
Physical Education and Free Electives (17 Credits)	
PE 100 Health and Physical Fitness	1
Physical Education Electives	3
Free Electives	13
Group A, B, C, D Courses (22 Credits)	
ANT 251 Physical Anthropology	3
GN 301 Genetics in Human Affairs *or*	
GN 411 The Principles of Genetics	3-4
SOC 351 Population and Planning	3
Electives in A, B, C, or D Courses	12-13
Departmental Requirements and Electives (28 Credits)	
SOC 241 Rural Society, USA	3
SOC 300 Sociological Research Methods	4
SOC 301 Human Behavior	3
SOC 311 Community Relationships	3
SOC 342 Rural Soc. Around World	3
SOC 400 Theories of Social Structure *or*	
SOC 401 Theories of Social Interaction	3
SOC 410 Formal Organizations	3
SOC 485 Ind. Field Work in Applied Soc.	3
SOC Elective at 400 level or above	3
Strongly Recommended: For students interested in applied quantitative methods, PS 471, SOC 590 and additional courses in statistics.	
Minimum Hours Required for Graduation	130

CONCENTRATION IN CRIMINAL JUSTICE

(ALS 103, Languages, Physical and Biological Sciences, Physical Education and Free Electives are same as above.)

Social Sciences and Humanities (21 Credits)	
ANT 252 Cultural Anthropology	3
EB 201 Economics I *or*	
EB 212 Economics of Agriculture	3
PS 201 Introduction to American Government	3
PS 311 Criminal Justice Policy Process	3
SOC 202 Principles of Sociology	3
Electives from Humanities—Group D Area I discipline	6
Group A, B, C, D Courses (22 Credits)	
ANT 251 Physical Anthropology	3
GN 301 Genetics in Human Affairs *or*	
GN 411 The Principles of Genetics	3-4
SOC 306 Criminology	3
SOC 351 Population and Planning	3
SOC (PS) 413 Criminal Justice Field Work	4
Political Science Elective	3
Electives	2-3
Departmental Requirements (28 Credits)	
SOC 241 Rural Society USA	3
SOC 300 Sociological Research Methods	4
SOC 301 Human Behavior	3
SOC 342 Rur Soc Around World	3
SOC 400 Theories of Social Structure *or*	
SOC 401 Theories of Social Interaction	3
Criminal Justice Electives (must include one course in Sociology and one course in Political Science . . . See adviser for listing.)	12

MINOR IN APPLIED SOCIOLOGY

The Minor in Applied Sociology is a 15-hour program aimed at providing students the basic conceptual framework of sociology and the information necessary for applying this approach to the resolution of problems, especially in the work and organizational environments.

SOIL SCIENCE

Williams Hall (Room 2234)

Professor E. J. Kamprath, *Head of the Department*

Associate Professor H. J. Kleiss, *Undergraduate Coordinator*

TEACHING AND RESEARCH

Alumni Distinguished Graduate Professors: S. W. Buol, W. A. Jackson

William Neal Reynolds Professors: W. A. Jackson, E. J. Kamprath

Professors: D. K. Cassel, F. R. Cox, C. B. Davey, J. W. Gilliam, D. W. Israel (USDA), L. D. King, G. S. Miner, C. D. Raper, Jr., P. A. Sanchez, R. J. Volk, S. B. Weed, A. G. Wollum; *Adjunct Professors:* P. G. Hunt, R. J. McCracken; *Professors Emeriti:* W. V. Bartholomew, G. A. Cummings, R. W. Cummings, J. W. Fitts, C. B. McCants, W. G. Woltz; *Associate Professors:* A. Amoozegar, S. W. Broome, G. D. Hoyt, J. E. Shelton, M. J. Vepraskas; *Adjunct Associate Professor:* M. R. Tucker; *Associate Professors Emeriti:* W. D. Lee, R. E. McCollum; *Assistant Professors:* T. J. Smyth, M. G. Wagger; *Assistant Professors Emeriti:* L. E. Aull, C. K. Martin; *Senior Researcher:* W. P. Robarge; *Research Associates:* E. W. Harmsen, H. K. Mwandemere, P. D. Smithson; *Associate Members of the Faculty:* E. D. Seneca (Botany); H. L. Allen, Jr., L. T. Henry, R. Lea (Forestry), S. R. Shafer (Plant Pathology); R. W. Skaggs (Biological & Agricultural Engineering); J. B. Weber (Crop Science).

EXTENSION

Professor J. P. Zublena, *In Charge*

Alumni Distinguished Undergraduate Professor: M. G. Cook

Professor: J. V. Baird; *Professor Emeritus:* J. A. Phillips; *Associate Professors:* M. T. Hoover, J. P. Lilly, G. C. Naderman, Jr.

The Department of Soil Science trains students in fundamentals of soils, develops an understanding and appreciation of soils as a resource, and presents principles of soil management and utilization for both farm and non-agricultural purposes. Soils constitute one of the largest capital investments in farming and proper soil management is essential for efficient production. Future world food needs will require people conversant in soil resources and use of fertilizers. Soil properties are important considerations in urban-suburban planning and development. Also, knowledge of soil and its interactions with potential pollutants is essential in maintaining environmental quality. Therefore, the demand for people trained in soils by private consultants, agribusiness, research, service, planning-development, education and conservation-related agencies should continue to be great.

OPPORTUNITIES

Soil science graduates fill positions of leadership and service in land resource planning, conservation and agriculture. Among these are opportunities as farm operators and managers, county agricultural extension agents and employees of other public advisory agencies, Soil Conservation Service and other conservation-related agencies concerned with soil resources. Graduates also serve as technical representatives and salesmen in fertilizer companies and in other agribusiness activities. Many opportunities exist for private consulting soil scientists who serve a variety of clientele needs.

Provision is made for students wishing a more thorough training in biological sciences, chemistry, mathematics and physics leading to graduate study. (See listing of graduate degrees.) Students with advanced degrees have wide opportunities in teaching, research, service and extension with state, federal and private educational and research institutions and agencies.

SOIL SCIENCE CONCENTRATION

The Bachelor of Science degree may be obtained through programs in agronomy or conservation. The agronomy program is administered jointly with the Crop Science Department. A soil science concentration is available in the agronomy curriculum. A soils concentration is also available in the conservation curriculum. (The agronomy and conservation curricula are shown earlier under College of Agriculture and Life Sciences).

MINOR IN SOIL SCIENCE

The academic minor in Soil Science is offered to students desiring a strong knowledge of the principles of Soil Science to complement their major. It is intended to strengthen the understanding of basic physical and chemical soil properties that would be relevant to a student's particular land management interest. These interests may include but are not limited to conservation, forestry, geology, landscape architecture, horticulture, biological and agricultural engineering, agricultural business management, or agricultural education. Fifteen hours of required courses and three hours of electives are necessary to complete the minor.

PRE-PROFESSIONAL PROGRAM IN VETERINARY MEDICINE

Students with interests in veterinary medicine who enroll in the undergraduate programs at North Carolina State University should pursue a baccalaureate degree in a major area that fulfills the requirements of the pre-professional program. Pre-professional courses are designed to give students a background in animal health, poultry health and laboratory animal care. At the present time a preveterinary curriculum is offered in the College of Agriculture and Life Sciences. A student may major in animal science, poultry science, biochemistry, zoology, biological sciences, or biological sciences options, as well as in other science curricula. The choice of the degree program should be carefully considered to encompass alternate career objectives. If a student is accepted to veterinary college before completion of his or her undergraduate degree, some course credits may be transferred from the veterinary program toward completion of the Bachelor of Science degree. Arrangements for this procedure should be made with the degree-granting college or department prior to entering veterinary college.

The courses listed below are minimum requirements for all students applying for entrance to the College of Veterinary Medicine at N. C. State University. A grade of C or better on each course and an overall grade point average of 2.75 or above is required for application.

Languages	*Credits*
ENG 111, 112 English Composition	6
Physical Sciences	
BCH 451 Introduction to Biochemistry	3
CH 101 General Chemistry	4
CH 107 Principles of Chemistry	4
CH 221, 223 Organic Chemistry I & II	8
MA 121 Elements of Calculus *or*	
MA 131 Analytical Geometry & Calc. A	4
PY 211, 212 College Physics I, II *or*	
PY 221 College Physics	8-5
ST 311 Introduction to Statistics	3
Biological Sciences	
BS 100 General Biology	4
GN 411 The Principles of Genetics	4
MB 401 General Microbiology	4

Nutrition
At least one course in animal nutrition is necessary.
ANS (PO) 204 Feeds and Feeding *or*
ANS (FS, NTR) 301 Modern Nutrition *or*
ANS (NTR, PO) 415 Comparative Nutrition 3-4
Faculty advisors have a list of suggested courses for pre-professional students.

TOXICOLOGY

Method—Unit IV

Professor E. Hodgson, *Head of the Department*

Assistant Professor R. C. Smart, *Graduate Administrator*

Alumni Distinguished Graduate Professor and William Neal Reynolds Professor: E. Hodgson

Professors: W. C. Dauterman, T. J. Sheets; *Adjunct Professors:* A. L. Chasson, J. R. Fouts, J. A. Goldstein, R. J. Langenbach, R. M. Philpot; *Professor Emeritus:* F. E. Guthrie; *Associate Professor:* P. E. Levi; *Adjunct Associate Professor:* H. B. Matthews; *Assistant Professors:* G. A. LeBlanc, M. B. St. Clair; *Adjunct Assistant Professor:* P. A. James; *Research Associates:* D. G. Presuitti, R. L. Rose, J. R. Schiavone, K. Venkatesh.

The Department of Toxicology offers courses of study leading to the Master of Toxicology, Master of Science and Doctor of Philosophy degrees. The Department of Toxicology trains qualified individuals to conduct basic and applied scientific research on the mechanisms of chemically induced toxicity, to advance toxicology as a science and to communicate concepts of toxicology.

ZOOLOGY

Gardner Hall (Room 1627—South Wing)

Professor J. F. Roberts, *Interim Head of the Department*

Professor G. C. Miller, *Undergraduate Coordinator*

Alumni Distinguished Undergraduate Professor: J. F. Roberts

Professors: G. T. Barthalmus, P. C. Bradbury, B. J. Copeland, P. D. Doerr, W. C. Grant, C. F. Lytle, J. M. Miller, R. L. Noble, D. E. Smith, H. A. Underwood, J. G. Vandenbergh; *Adjunct Professors:* F. A. Cross, J. B. Funderburg, Jr., J. D. Hair, D. E. Hoss, G. R. Huntsman; *Professors Emeriti:* D. E. Davis, W. W. Hassler, M. T. Huish, T. L. Quay; *Associate Professors:* B. L. Black, P. T. Bromley, L. B. Crowder, M. N. Feaver, W. J. Fleming (USDD), J. F. Gilliam, R. M. Grossfeld, R. G. Hodson, S. C. Mozley, R. A. Powell, J. R. Walters; *Adjunct Associate Professors:* D. E. Hoss, C. S. Manooch, III, D. S. Peters, L. W. Reiter, G. J. SanJulian, G. W. Thayer; *Assistant Professors:* J. A. Collazo (USDD), J. M. Hinshaw, T. M. Losordo, J. A. Rice, C. V. Sullivan; *Adjunct Assistant Professors:* S. V. Chiavetta, D. R. Colby, R. J. Kavlock; *Adjunct Instructor:* R. B. Hamilton; *Research Associates:* C. A. Caldwell, M. L. Moser, W. J. Zielinski; *Teaching Technicians:* C. K. Heinsohn, J. W. Zimmerman; *Associate Members of the Faculty:* B. H. Grimes (Interdisciplinary Studies), E. J. Jones (Extension Forest Resources), R. A. Lancia (Forest Resources), K. H. Pollock (Statistics), T. G. Wolcott (Engineering and Marine, Earth and Atmospheric Sciences).

Affiliated Faculty, Medical Technology Programs

Bowman Gray School of Medicine/N. C. Baptist Hospital—
Michael O'Connor, M.D., Medical Director
Lenora Flynn, MT(ASCP), A.B., M.Ed.

Carolinas Medical Center—
Edward H. Lipford, III, M.D., Medical Director
Elizabeth T. Anderson, MHDL, MT(ASCP), CLS(NCA), Program Director

Duke University Medical Center—
Frances K. Widmann, M.D., Medical Director
Margaret Schmidt, MT(ASCP), SH, CLS(NCA), M.A., Program Director

Moses Cone Memorial Hospital—
Mary C. Steuterman, M.D., Medical Director
Jean G. Smith, MT (ASCP), M.Ed.

The Department of Zoology provides undergraduate and graduate instruction in specialized biological sciences areas. Undergraduates study all levels of biological organization from the molecular to the community. Zoology majors are well prepared for graduate work in zoology and related fields of sciences. (See listing of graduate degrees.) Participation in supervised programs of research is strongly encouraged. A strong science background is provided for students planning to enter dentistry, medicine, optometry, veterinary medicine and allied health sciences, such as medical technology. Ecology, including wildlife, fisheries, parasitology and marine biology are strong areas. Cellular and molecular biology, including neurobiology, also are emphasized.

OPPORTUNITIES

Bachelor of Science graduates in zoology have many career options. Graduates are well prepared for employment in various government agencies or private industries. Graduates may continue their education with studies leading to advanced degrees in many areas of biological sciences such as zoology, cell biology, wildlife and fisheries science, marine science and biomedical subdisciplines. Many also choose to enter professional schools for degrees in medicine, dentistry, veterinary medicine and other health related areas.

UNDERGRADUATE CURRICULA

The Bachelor of Science degree with a major in zoology, fisheries and wildlife sciences or medical technology is offered under the science curriculum of the College of Agriculture and Life Sciences. Within these majors a student may specialize depending upon interest and ability.

The zoology curriculum prepares students for graduate school, medical, dental, and veterinary schools. Certain professional schools have specific requirements which differ slightly from the zoology curriculum. Students should consult catalogs of specific professional schools to ensure completion of any special requirements.

Other curricula include the fisheries and wildlife sciences program and the medical technology program. The clinical year for the medical technology program is by competitive selection at an affiliated hospital. Students are advised by faculty in their special areas of interest.

CURRICULUM IN ZOOLOGY

		Credits
ALS 103	Introductory Topics in ALS	1
	Languages (12 Credits)	
ENG 111	Composition and Rhetoric	3
ENG 112	Composition and Reading	3
	Literature Elective	3
	Language or Communication Elective	3
	Humanities and Social Sciences (21 Credits)	
	Electives (no more than two in any one department)	21
	Physical and Biological Sciences (41 Credits)	
BS 100	General Biology	4
CH 101	General Chemistry	4
CH 107	Principles of Chemistry	4
CH 221	Organic Chemistry I	4
CH 223	Organic Chemistry II	4
GN 301	Genetics in Human Affairs *or*	
GN 411	Principles of Genetics	3-4
MA 111	Precalculus Algebra and Trig.	3
MA 131	Analytic Geometry & Calculus A	4
PY 211	College Physics I	4
PY 212	College Physics II	4
	Mathematical Science Elective: second calculus or computer science or ST 311	3

Physical Education and Free Electives
(17 Credits)

PE 100 Health and Physical Fitness 1
Physical Education Electives 3
Free Electives 13

Group A Electives
(8 Credits)

Restricted Electives 8

Departmental Requirements and Electives
(30 Credits)

ZO 205 Intro. to Cellular & Dev'mt. Zool. 4
ZO 208 Intro. to Organismal & Evolu. Zool. 4
ZO 305 Cell & Animal Physiology Lab 2
Selected Zoology Electives[1] 16
Selected Laboratory Courses[2] 4

Hours Required for Graduation 130

[1]ZOOLOGY ELECTIVES—16 credit hours to be selected from the following with at least one course from each category.

Organismal Level

ZO 303 (4)
ZO 315 (3)
ZO 402 (2)

Systems Level

ZO 421 (3)
ZO 323 (4)
ZO 361 (3)

Cellular and Molecular Level

BCH 451 (3)
BO/ZO 414 (3)
ZO 345 (4)

Supraorganismal Level

BO/ZO 360 (3)
ZO 410 (3)
ZO 450 (3)

[2]ZOOLOGY LABORATORIES—4 credit hours of laboratory work are to be selected from the following:

ALS 499 (1-3)—must be laboratory research
ZO 365 (1)—ZO 360 (3) is a corequisite
ZO 403 (2)
ZO 460 (2)
ZO 480 (3)
ZO 590 (1-3)—must be laboratory research

SPECIFIC RECOMMENDATIONS FOR RESTRICTED ELECTIVES

(SDM) Medical Schools and Dental Schools:
ZO 315, 323, 345; BCH 451; GN 412; MB 401, 411; CH 315 (required by many dental schools)
(SZO) Zoology:
BO 200; BCH 451; ENT 425; FW 221, 420; MB 401, 411; GN 412; ZO 212, 221, 315, 323, 410, 420, 425, 441 and any 500 level course; and any approved computer science, statistics, or mathematics course.

(See also Pre-Professional Program in Veterinary Medicine).

MINOR IN ZOOLOGY

A minor in zoology is available to undergraduates majoring in any department other than zoology. This minor will be useful to students applying to professional schools such as medicine, dentistry, veterinary medicine, and other health sciences. Basic knowledge in animal biology may also be useful to students seeking careers in government, industry, or education. The minor consists of a minimum of 15 credit hours, including two core courses, ZO 205 and ZO 208. The remaining courses must be selected from three- or four-credit courses at the 300 or 400 level with at least one course having a laboratory.

SCIENCE PROGRAM IN MEDICAL TECHNOLOGY

Professor G. C. Miller, *Undergraduate Coordinator*

Two programs are available in medical technology. The first is a four-year collegiate curriculum with a Bachelor of Science degree in zoology (see above) followed by a year of training in any hospital clinical laboratory approved by the American Medical Association. The second program is designed to be completed in four calendar years. The student takes the prescribed curriculum (see below) for three years at North Carolina State University and a fourth year (12 months) of clinical training at an affiliated hospital. Successful completion of this program qualifies the student for a Bachelor of Science degree in medical technology from N. C. State. Acceptance by the clinical laboratory is competitive and students in either program outlined above must apply for clinical training. After completion of either program the student is eligible to take the national examination for certification as a registered Medical Technologist.

	Credits
ALS 103 Introductory Topics in ALS	1
Languages (12 Credits)	
ENG 111 Composition & Rhetoric	3
ENG 112 Composition & Reading	3
English, Communication, or Language Elective	3
Literature Elective	3
Humanities and Social Sciences (21 Credits)	
Electives (no more than two courses in any one department)	21
Physical and Biological Sciences (27 Credits)	
BS 100 General Biology	4
CH 101 General Chemistry I	4
CH 107 Principles of Chemistry	4
MA 111 Precalculus Algebra and Trigonometry	3
MA 131 Analytic Geometry & Calc. A	4
PY 211, 212 College Physics I, II	8
Physical Education and Free Electives (9 Credits)	
PE 100 Health and Physical Fitness	1
Physical Education Electives	3
Free Electives	5
Group A Courses (19-20 Credits)	
CH 221, 223 Organic Chem. I & II	8
GN 411 The Principles of Genetics *or*	
GN 301 Genetics in Human Affairs	3-4
MB 401 General Microbiology	4
MB 411 Medical Microbiology	4
Departmental Requirements and Electives (11 Credits)	
ZO 201 General Zoology	4
ZO 303 Vert. Zoology	4
ZO (BO) 414 Cell Biology *or*	
ZO 421 Principles of Physiology	3
	100

plus

Twelve-month course in Medical Technology at one of the affiliated hospital programs.

Microbiology	
Clinical Chemistry	
Hematology	*35-50 hours*
Histology & Cytology	*(variable in the four programs)*

Minimum Hours Required for Graduation 135

The affiliated programs are:
Bowman Gray School of Medicine, Winston-Salem, N.C.
Carolinas Medical Center, Charlotte, N.C.
Moses H. Cone Hospital, Greensboro, N.C.
Duke Univ. Medical Center, Durham, N.C.

FISHERIES AND WILDLIFE SCIENCES

Professor R. L. Noble, *Undergraduate Coordinator*

The Departments of Zoology and Forestry jointly administer the program in Fisheries and Wildlife Sciences. Undergraduate education emphasizes ecological principles and their application to research problems and natural resource management needs. Majors are well prepared for graduate work and entry-level professional positions.

	Credits
ALS 103 Introductory Topics in ALS	1
Languages (12 Credits)	
ENG 111 Composition & Rhetoric	3
ENG 112 Composition & Reading	3
ENG 333 Commun. for Science & Res.	3
COM (SP) 110 Public Speaking	3
Humanities and Social Sciences (21 Credits)	
Economics Electives	6
Literature Elective	3
Political Science Electives	6
Electives (3 credits must come from Humanities—Group D, Area I Discipline)	6

Physical and Biological Sciences (49-50 Credits)

BO (ZO) 360 Introduction to Ecology	3
BO (ZO) 365 Ecology Lab	1
BS 100 General Biology	4
CH 101 General Chemistry I	4
CH 107 Principles of Chemistry	4
CH 221 and CH 223 Organic Chemistry I and II *or*	
CH 220 Intro. Organic Chem. and Phys. Sci. Elective (4 hours)	8
GN 301 Genetics in Human Affairs *or*	
GN 411 Principles of Genetics	3
MA 131 Analytic Geometry and Calculus A	4
PY 221 College Physics	5
ST 311 Introduction to Statistics and *one of the following:*	
BAE 241, CSC 200, FOR 273, MA 214, MA 231	6
ZO 201 General Zoology	4
ZO 421 Principles of Physiology	3

Physical Education and Free Electives (12 Credits)

PE 100 Health and Physical Fitness	1
Physical Education Electives	3
Electives	8

Group A, B, C Courses
(9 hours, wildlife) (12 hours, fisheries)

	Credits	Fisheries	Wildlife
ANS (PO, NTR) 415 Comparative Nutrition	3	X	X
ANS 502 Reproductive Physiology of Vertebrates	3	X	X
BO 565 Plant Community Ecology	4		X
BO 574 Phycology	3	X	
CE 486 Sanitary Engineering Measurements of Water Quality	3	X	
ENT (ZO) 425 General Entomology	3	X	X
FOR 210 Dendrology-Gymnosperms	2		X
FOR 211 Dendrology-Angiosperms	2		X
FOR 272 Forest Mensuration	3		X
FOR 353 Air Photo Interpretation	3		X
FOR 472 Renewable Resource Management	3	X	X
FOR 501 Forest Influences and Watershed Management	3		X
FOR 591 Forestry Problems	Arranged	X	X
FW (ZO) 515 Growth and Reproduction of Fishes	3	X	
FW (ZO) 554 Wildlife Field Studies	3	X	
FW (ZO) 586 Aquaculture I	3	X	
FW (ZO) 587 Aquaculture I Laboratory	1	X	
MB 501 Advanced Microbiology I	3	X	X
MEA 200 Introduction to the Marine Environment	3	X	
MEA (ZO) 520 Principles of Biological Oceanography	3	X	
RRA 442 Wildland Recreation Environments	3		X
SSC 200 Soil Science	4		X
SSC 452 Soil Classification	4		X
ZO 315 General Parasitology	3	X	X
ZO 323 Comparative Anatomy	4	X	X
ZO 441 Biology of Fishes	3		X
ZO 442 Biology of Fishes Laboratory	1		X
ZO 501 Ornithology	3	X	X
ZO 517 Population Ecology	3	X	X
ZO 419 Introduction to Limnology	4		X
ZO 544 Mammalogy	3	X	X

Departmental Requirements and Electives
(32 hours, wildlife) (29 hours, fisheries)

		Credits	Fisheries	Wildlife
BO 200	Plant Life	4		X
BO 403	Systematic Botany	4		X
FW (ZO) 221	Conservation of Natural Resources	3	X	X
FW (FOR) 310	Fisheries and Wildlife Inventory & Management	6	X	X
FW (ZO) 353	Wildlife Management	3	X	X
FW (FOR) 404	Forest Wildlife Management	3		X
FW (ZO) 420	Fishery Science	3	X	X
FW (ZO) 430	Fish and Wildlife Administration, Policy and Law	3	X	X
FW (ZO) 553	Principles of Wildlife Science	3	X	X
ZO 441	Biology of Fishes	3	X	
ZO 442	Biology of Fishes Laboratory	1	X	
ZO 419	Introduction to Limnology	4	X	
	Minimum Hours Required for Graduation	136		

N.C. AGRICULTURAL RESEARCH SERVICE

D. F. Bateman, *Dean of Agriculture and Life Sciences*

R. J. Kuhr, *Associate Dean and Director of N.C. Agricultural Research Service*

G. J. Kriz, *Associate Director of Research*

W. H. Johnson, *Assistant Director of Research*

The North Carolina Agricultural Research Service is the agricultural, life sciences, forestry, and home economics research agency of the State of North Carolina. It is funded principally by appropriations from the North Carolina General Assembly, federal formula funds and grants and contracts.

The purpose of the N.C. Agricultural Research Service is to conduct research on (1) the development and maintenance of an effective agricultural and forestry industry in North Carolina, including economically sound sources of supplies and equipment needed in agriculture and forestry and market outlets for the products of agriculture and forestry, (2) the improvement of rural homes, rural life and rural environment, and (3) the maintenance of a reliable supply of agricultural and forestry products for the consuming public. This requires research to solve current problems and research to provide a foundation of scientific knowledge in the biological, physical and social sciences.

The N.C. Agricultural Research Service faculty brings well-trained personnel to the university, whose teaching in many specialized fields agricultural, biological and social sciences assures the maintenance of curricula of high standards. It contributes to the advanced training of students who are destined to become the leaders, teachers and investigators necessary in the maintenance of agriculture and forestry on a sound economic plane.

PUBLICATIONS

The N.C. Agricultural Research Service publishes bulletins and scientific papers on research results conducted by the staff. Copies of bulletins may be obtained from the Department of Agricultural Communications and scientific papers from the author.

SERVICES

The faculty of the N.C. Agricultural Research Service conduct original and other research bearing directly on and contributing to the establishment and maintenance of permanent and effective agricultural and forestry industries in North Carolina. This research includes field and laboratory experimentation in the biological, physical, social, and environmental sciences. Primary emphasis is given to the production, processing,

distribution, and consumption of the many agricultural and forestry commodities produced throughout the state. Also, major attention is given to research programs aimed at improving the quality of life of both rural and urban peoples.

AGRICULTURAL EXTENSION SERVICE

D. F. Bateman, *Dean of Agriculture and Life Sciences*

R. C. Wells, *Associate Dean and Director of the Agricultural Extension Service*

T. N. Hobgood, *Interim Associate Director of Extension*

The Agricultural Extension Service of North Carolina State University is a cooperative undertaking among the United States Department of Agriculture, the State of North Carolina, the 100 counties in the state and the Cherokee Indian Reservation. Its work is supported by federal funds made available under the Smith-Lever Act of 1914, as amended, by state and county appropriations, and by grants and contracts.

The federal and state appropriations are used to maintain an administrative and specialist staff and to pay a portion of the salary and the travel expenses of the county extension agents. Under this cooperative arrangement, the Agricultural Extension Service serves as the "educational arm" of the United States Department of Agriculture, and as the "field faculty" of North Carolina State University in the areas of agriculture and natural resources; family living; 4-H and youth; and, community and rural development.

The primary purpose of the North Carolina Agricultural Extension Service is to take to the people of the state the latest and best information obtainable—particularly that which is related to agriculture and natural resources; home economics and youth; and, rural development—and help them to interpret and use this information in building a more prosperous and satisfying life.

This program has sufficient flexibility to permit special attention to the problems, needs and interests of the people in each county. County Advisory Councils are utilized to determine and prioritize the county educational program content. Assistance is given to individuals, families, communities, agricultural and seafood processing and marketing firms, other businesses and certain organizations. This includes work with adults and youth in both the city and rural areas.

In carrying out this educational program, a variety of methods and techniques are employed: method and result demonstrations; meetings; visits to farms, homes and businesses; organized groups of men, women and youth; tours; leaflets, pamphlets and other printed materials and mass media.

The basic sources of information to be taught through this educational program are the findings and recommendations resulting from research conducted by the Agricultural Research Service in this and other states and by the United States Department of Agriculture.

AGRICULTURAL INSTITUTE

Patterson Hall (Room 107)

D. F. Bateman, *Dean of Agriculture and Life Sciences*

J. L. Oblinger, *Associate Dean and Director of Academic Affairs*

J. F. Ort, *Assistant Director of Academic Affairs and Director of the Agricultural Institute*

W. C. Grant, *Assistant Director of Academic Affairs*

The Agricultural Institute is a two-year, terminal academic program which provides education and training in food, agriculture, horticulture, turfgrass management and agribusiness. It is part of the College of Agriculture and Life Sciences at North Carolina State University. This program began in 1959 and was funded by legislative appropriation. Its objective is to train those desiring a comprehensive education in the food and agricultural sciences and agribusiness.

Individuals with institute training command attractive salaries, assume a more prominent role of leadership and become a distinct asset to various segments of the industry related to food and agriculture. They make significant contributions to their community, state and nation by being involved in the world's most vital industry.

The instructional programs are organized and conducted as a part of the over-all resident instruction program for Agriculture and Life Sciences. The Institute is an addition to and not a substitute for, the college's regular degree granting program. However, the faculty in residence for the four-year programs are responsible for organizing and teaching courses offered by the Institute.

People with training similar to that of the Institute are in demand by food and agricultural industries. As demand changes, courses will be evaluated and alterations will be made accordingly. Such a re-evaluation also aids the technical manpower needs of industry.

OPPORTUNITIES

Rapid technical advancement has been important in changing agriculture from a small production industry to the nation's largest industry. Closely associated with production agriculture are those areas related to recreation and beautification such as turfgrass management, flowers and ornamental plants. Increased production and consumer demand for convenience-type foods have stimulated the food processing industry, in turn increasing food distribution requirements.

Today's complex agriculture requires a larger work force. This work force must be able to deal with a vast array of problems and opportunities and Institute graduates can assume responsible positions in the total agricultural industry. Some career examples are: agricultural lending institution agent, farm and herd managers, research technicians, salesmen, retail farm supply and equipment outlet managers, golf course superintendents, nursery managers, agricultural pest control specialists, quality control technicians, food service supervisors and others. More job opportunities than graduates make salaries attractive.

The college maintains a Placement Office to assist graduates in finding employment.

ENTRANCE REQUIREMENTS

Any individual who has received a diploma from an accredited high school or has passed the high school equivalency examination administered by the State Department of Public Instruction is eligible for admission consideration. Each application will be reviewed and evaluated by the Institute Director.

For additional information write: Director, Agricultural Institute, Box 7642, 107 Patterson Hall, N.C. State University, Raleigh, N.C. 27695-7642, Telephone (919) 737-3248.

PROGRAMS OF STUDY

Graduates of the Agricultural Institute are awarded the Associate in Applied Science degree. The nine programs of study are: Agribusiness Management; Agricultural Mechanization and Management; Agricultural Pest Control; Field Crops Technology; Ornamentals and Landscape Technology; Food Processing, Distribution and Service; General Agriculture; Livestock Management and Technology (animal husbandry option, dairy husbandry option, swine husbandry option); and Turfgrass Management.

SCHOOL OF DESIGN

Brooks Hall

J. T. Regan, *Dean*

D. W. Dalton, *Associate Dean and Coordinator of Advising*

J. P. Rand, *Assistant Dean*

G. J. Hardie, *Director of Research*

V. W. Aldridge, *Administrative Assistant*

C. Carlton, *Librarian, Design Library*

W. K. Bayley, *Learning Resources Specialist, Media Center*

Wayne Godwin, *Acting Learning Resources Specialist, Computer Center*

R. Goldberg, *Learning Resources Specialist, Materials Processing Lab*

The School of Design, since its beginning in 1948, has addressed design in the broadest sense involving the disciplines of architecture, landscape architecture, product and visual design in a context of educational innovation. While the designer's traditional role is understood as that of giving meaningful form to the environment, the school gives attention to the larger responsibility of design in human, social, economic, political and behavioral terms. The school seeks to develop the designer's perception, knowledge base, skills and analytical problem solving abilities.

The expanding range of career opportunities in design, professional and otherwise, is equaled by the varied interests possessed by our students. Through a selective admissions process, the school's student population is highly motivated and heterogeneous. The faculty represents an equally broad spectrum of educational and professional expertise. The diversity of the faculty, both professionally and philosophically, provides unique opportunities for student development. These three factors in our educational matrix (career opportunities, student interests, and faculty expertise) are supported with a curriculum which affords each student the ability to shape, with faculty advice, a plan of study capable of facilitating his or her interests. While the school embraces the design disciplines of architecture, design, landscape architecture, product and visual design within a departmental structure, it functions as a unified educational center, interactive and dedicated to preparing designers who are capable of shaping the environment in whatever scale they choose but in response to the needs of society.

CURRICULA AND DEGREES

The School of Design offers undergraduate instruction leading to a Bachelor of Environmental Design degree in the disciplines of architecture, design, landscape architecture, product design and visual design.

The learning activities for our students are divided into three curriculum areas: (1) general education courses including English, mathematics, humanities, social sciences, and natural sciences; (2) core courses which deal with bodies of knowledge and skills applicable to design and common to all disciplines, including communication and graphics, behavior, environment, history and philosophy, physical elements and systems, methods and management (these courses are largely taught within the school but include selected university courses as well); (3) studio courses providing the arena in which students apply their skills and knowledge to problems that are both real and theoretical. These synthetic activities are time intensive and are fundamental to design education.

After the common experience in first year, these studios relate to the student's declared disciplinary major. The flexibility of this curriculum plan affords the student the opportunity to concentrate in a single discipline but facilitates his or her contact with other design principles. The curriculum reflects the reality of the environmental marketplace—where, in addition to their faculty mentors, our students are exposed to a broad range of design professionals—through guest lectures, juries, projects and workshops.

Graduate studies are also offered in architecture, landscape architecture and product design. See the Graduate Catalog for information on the Master's programs.

DESIGN

Brooks Hall

Associate Professor C. E. Joyner, *Head of the Department*

Alumni Distinguished Undergraduate Professors: C. D. Cox, M. Pause

Professors: M. Pause, E. W. Taylor; *Professors Emeriti:* G. L. Bireline, J. H. Cox, D. R. Stuart; *Associate Professors:* C. Cox, B. Schulman, S. Toplikar, S. Wilchins; *Assistant Professors:* L. M. Diaz, M. Porter, D. Raymond.

In the Bachelor of Environmental Design degree, design is used as the vehicle for a broadly based, multidisciplinary undergraduate education experience which fully utilizes the range of diverse faculty capabilities. Through flexible curriculum structure and course sequencing, students are able to assemble optional learning paths which meet their individual needs. This degree provides an alternative for students who have specific interests and capabilities outside the school's existing degree tracks and students who desire a broader design education taking advantage of the range and diversity of the school's offerings. Additionally, a concentration in Fibers and Surface Design is available within this program. Those students selecting the Bachelor of Environmental Design degree may wish to use it as a foundation for later graduate study in a specific design discipline.

The Department of Design firmly believes that there is an essential need for students in a research and technically based university to engage in course work that fosters creative thinking. To meet this need, the Department of Design offers a Minor in Design, available to majors in any field. Four specific tracks are currently available: fibers and surface design, painting, drawing, and sculpture. To complete the minor, 9 hours of prerequisites and 15 hours of specified design courses are required.

The Department of Design also provides a common first year experience for all students entering the School of Design. Design Fundamentals focuses on exposure to basic design concepts and provides a general introduction to the fields of design.

ENVIRONMENTAL DESIGN CURRICULUM

Degree: Bachelor of Environmental Design

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
DF 101 Design Fundamentals Studio I	6	DF 102 Design Fundamentals Studio II	6
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
PE 100 Health and Physical Fitness	1	Humanities and Social Sciences Elective[4]	3
Humanities and Social Sciences Elective[4]	3	Mathematics[1]	4/3
Mathematics[1]	4	Physical Education	1
	17		16/17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Studio[2]	6	Studio[2]	6
Natural Science Elective[3]	4	Natural Science Elective[3]	4
Humanities and Social Sciences Elective[4]	3	Humanities and Social Sciences Elective[4]	3
Core[5]	3	Core[5]	3
Physical Education	1	Physical Education	1
	17		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Studio[2]	6	Studio[2]	6
Humanities and Social Sciences Elective[4]	3	Humanities and Social Sciences Elective[4]	3
Core[5]	3	Core[5]	3
Core[5]	3	Core[5]	3
Free Elective	3		15
	18		

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Studio[2]	6	Studio[2]	6
Core[5]	3	Core[5]	3
Core[5]	3	Core[5]	3
Free Elective	3	Free Elective	3
	15		15

Minimum Hours Required for Graduation 130*

[1]Must include one calculus course and may include any of the courses on the departmental listing of courses acceptable toward this requirement.

[2]A minimum of six 400-series studios are required. No more than one studio may be taken in any semester.

[3]Selected from natural, physical, or biological sciences, but not to include math or computer science courses. For further clarification, see departmental listing of courses acceptable toward this requirement.

[4]The University requires 18 hours in the humanities/social sciences area, a minimum of six hours in social sciences and six hours in humanities. The remaining courses are not limited to any specific department. For further clarification, see the departmental listing of courses applicable toward this requirement.

[5]Each student is required to take a minimum of 30 credit hours which are to be selected from the six cores (Graphics and Communications, Behavior, Environment, History and Philosophy, Physical Elements and Systems, and Methods and Management). A student pursuing a degree in this department must have a Design faculty member as an advisor.

*In order to receive two degrees from the School of Design, a student must complete 30 credit hours above the 129 hour requirement. These 30 hours are to include 18 credits in 400 level studios and 12 credits in core courses above those described above.

MINOR IN DESIGN

Before entering into a minor in the Department of Design, students must first complete 9 hours of prerequisite courses which provide an essential foundation in design:

DF 111—Two-Dimensional Design for Non-Design Majors
DF 112—Three-Dimensional Design for Non-Design Majors
DN 311-F—Drawing

To complete the minor program, students will take 15 hours of design courses, 12 hours of which must be above the 100 level, at least 6 of which must be at the 300 level or above. Four specific tracks are available in the minor: fibers and surface design, painting, drawing, and sculpture. Courses are chosen from a list of recommended courses in each track in consultation with the adviser. Application forms may be obtained from the department head. Each student will be assigned an adviser consistent with his/her track selection.

ARCHITECTURE

Brooks Hall

Professor Robert P. Burns, *Head of the Department*

Alumni Distinguished Undergraduate Professor: V. F. Shogren

Professors: P. Batchelor, G. Bizios, R. H. Clark, J. T. Regan, G. J. P. Reuer, H. Sanoff, V. Shogren; *Professors Emeriti:* H. H. Harris; *Associate Professors:* F. Harmon, W. Place, J. P. Rand, L. Sanders, J. O. Tector, P. Tesar; *Adjunct Associate Professor:* E. F. Harris, Jr.; *Associate Professor Emeritus:* D. W. Barnes; *Assistant Professor:* F. Rifki; *Adjunct Lecturer:* T. C. Howard.

In a world of changing social and cultural conditions, economics, technology, urbanization and aesthetic consciousness, the central task of the architect remains—to give meaningful form to the physical environment. However, these rapid changes force today's architects to look at their world differently than did earlier generations. Modern architects must concern themselves not only with traditional design issues, but also with such emerging concerns as the preservation and adaptive use of older buildings and neighborhoods, energy conservation, and the form of rapidly expanding urban centers. The aesthetic revolution of the past few decades has freed architects from the rigidity of earlier theory, allowing greater diversity and expressiveness in architectural design.

The architecture curriculum balances professional studies with a broad general education. University requirements in mathematics, English, natural science, social sciences and humanities are integrated with architectural design studios and a rich selection of design support courses. Central to the curriculum is the design studio—a working laboratory in which analysis and synthesis become real and meaningful activities to the architecture student.

To address the diversity of roles and responsibilities in architecture, the Department of Architecture offers several curricula. The undergraduate Bachelor of Environmental Design in Architecture stresses the education of the individual and serves as the foundation for advanced study in the discipline. The first year is spent on design fundamentals in a curriculum common to all students in the School of Design. In the following years students receive a broad introduction to architectural theory, history, technology and design process while exploring other educational opportunities within the university.

Following this pre-professional program students may continue their studies in either of two professional programs—the one-year, post-graduate Bachelor of Architecture or the two-year Master of Architecture program (see the NCSU *Graduate Catalog* for information on the latter program). Entry into both advanced programs is competitive; and, to be accepted, students must demonstrate potential for professional accomplishment, capability in design, and satisfy a specific set of professionally-oriented undergraduate course requirements. Many students spend one or more years gaining professional experience in architecture firms or related fields before pursuing the advanced degrees.

Educational enrichment is an important characteristic of the architectural program. The School of Design regularly presents public lectures by leading professionals and exhibitions of design and art work. Electives are available in related disciplines—painting, sculpture, photography, landscape architecture, product and visual design. Further design exposure is available through a variety of foreign study programs and field trips to buildings and urban centers of architectural interest.

OPPORTUNITIES

Graduates with the pre-professional Bachelor of Environmental Design in Architecture degree pursue careers in private architectural practice, building construction, development, and public agencies. North Carolina and many other states are increasingly restricting professional licensing in architecture to holders of accredited advanced degrees such as the Bachelor of Architecture and the Master of Architecture. This educational requirement must be followed by three years of professional experience and completion of a comprehensive examination to qualify for professional certification as an architect.

ARCHITECTURE CURRICULUM

Degree: Bachelor of Environmental Design in Architecture

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
DF 101 Design Fundamentals Studio I	6	DF 102 Design Fundamentals Studio II	6
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
PE 100 Health and Physical Fitness	1	Humanities/Social Sciences Elective[4]	3
Humanities/Social Sciences Elective[4]	3	Mathematics[1]	3-4
Mathematics[1]	3	Physical Education	1
	16		16-17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Studio[2]	6	Studio[2]	6
Core[5]	3	Core	3
Humanities/Social Sciences Elective[4]	3	Humanities/Social Sciences Elective[4]	3
Natural Science Elective[3]	4	Natural Science Elective[3]	4
Physical Education	1	Physical Education	1
	17		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Studio[2]	6	Studio[2]	6
Core[5]	3	Core[5]	3
Core[5]	3	Core[5]	3
Humanities/Social Sciences Elective[4]	3	Humanities/Social Sciences Elective[4]	3
Free Elective	3		15
	18		

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Studio[2]	6	Studio[2]	6
Core[5]	3	Core[5]	3
Core[5]	3	Core[5]	3
Free elective	3	Free elective	3
	15		15

Minimum Hours Required for Graduation ...129[6]

[1]Must include one calculus course and may include any of the courses on the departmental listing of courses acceptable towards this requirement.

[2]A minimum of six 400 series studios are required with a minimum of four of the six being ARC. No more than one studio may be taken in any semester.

[3]Selected from natural, physical, or biological sciences, but not to include math or computer science courses. For further clarification, see departmental listing of courses acceptable towards this requirement.

[4]The university requires 18 hours in social science/humanities area. The courses are not limited to any specific department but are to show a distribution between the social sciences and humanities. For further clarification, see the departmental listing of courses acceptable towards this requirement.

[5]Each student is required to take a minimum of 30 credit hours which are to be selected from the six cores (Graphics and Communications, Behavior, Environment, History and Philosophy, Physical Elements and Systems, and Methods and Management).

[6]In order to receive two degrees from the School of Design, a student must complete 30 credit hours above the 129 hour requirement. These 30 hours are to include 18 credits in 400 level studios and 12 credits in core courses above those described above.

ARCHITECTURE CURRICULUM (Fifth Year)

Degree: Bachelor of Architecture

The *prerequisites* for entry into the fifth year are:

	Credits
University Requirements	42
Free Electives	9
Studios	48
DF 101, 102	12
ARC 400	24
ARC 400 or other 400 level studios	12
Core Courses	30
Must include the following courses:	
History of Design (DN 141 or 142 or ARC 244)	3
Structures (ARC 251, 351, 352)	9
Architectural Materials (ARC 254)	3
Environ. Control Systems (ARC 253)	3
Design Methods (ARC 261)	3
The Profession of Architecture (ARC 263)	1
Minimum Hours Required for Graduation	129

The fifth year *requirements* are:

Studios (ARC 501, 502)	12
Site Planning (LAR 430)	3
Architectural Construction Systems (ARC 432)	3
History (ARC 441 or 447, or 448)	3
Professional Practice (ARC 561)	3
Elective from 400 or 500 level (ARC) courses in School of Design	6
Fifth Year Minimum Hours	30
Minimum Hours Required for Graduation	159

LANDSCAPE ARCHITECTURE

Professor A. R. Rice, *Head of the Department*

Professors: R. C. Moore, R. R. Wilkinson; *Professors Emeriti:* R. E. Stipe, E. G. Thurlow; *Associate Professors:* A. R. Abbate, D. W. Dalton, D. Wood; *Assistant Professor:* F. Magallanes; *Associate Members of the Faculty:* W. E. Hooker, J. C. Raulston, M. E. Traer (Horticultural Science).

Landscape architecture is the profession concerned with location, design, and development of residential, commercial, institutional, recreational and other community land uses. Preservation and conservation of visual amenities, unique natural areas, and historic resources, are important components of landscape architecture. The student studies history of landscape architecture, planting design, materials and construction, site planning, graphic communication and community design. These subjects are applied to actual design problems in landscape architecture studios.

OPPORTUNITIES

There are approximately 30,000 practicing landscape architects in the U.S. and growth is projected as among the "Top Ten for the Eighties," by the U.S. Bureau of Labor Statistics. Landscape architects are employed by private firms and by agencies of government such as parks and recreation, forestry, and planning and environmental protection. Many pursue graduate degrees, qualifying them for careers in college teaching and more advanced assignments.

LANDSCAPE ARCHITECTURE CURRICULUM

Degree: Bachelor of Environmental Design in Landscape Architecture

FRESHMAN YEAR

Fall Semester	*Credits*
DF 101 Design Fundamentals Studio I	6
ENG 111 Composition & Rhetoric	3
PE 100 Health and Physical Fitness	1
Humanities/Soc. Sci. Elective[2]	3
Mathematics Elective[1]	4
	17

Spring Semester	*Credit*
DF 102 Design Fundamentals Studio II	6
ENG 112 Composition & Reading	3
Humanities/Soc. Sci. Elective[2]	3
Math Elective[1]	3
Physical Education Elective	1
	16

SOPHOMORE YEAR

Fall Semester	*Credits*
Humanities/Soc. Sci. Elective[2]	3
Landscape Concentration[4]	3
Natural Science Elective[3]	4
Studio[5]	6
Physical Education Elective	1
	17

Spring Semester	*Credits*
Landscape Concentration[4]	3
Landscape Concentration[4]	3
Natural Science Elective[3]	4
Studio[5]	6
Physical Education Elective	1
	17

JUNIOR YEAR

Fall Semester	*Credits*
Advised Elective[6]	3
Humanities/Soc. Sci. Elective[2]	3
Landscape Concentration[4]	3
Landscape Concentration[4]	3
Free Elective	3
	15

Spring Semester	*Credits*
Advised Elective[6]	3
Humanities/Soc. Sci. Elective[2]	3
Landscape Concentration[4]	3
Studio[5]	6
Free Elective	3
	18

SENIOR YEAR

Fall Semester	*Credits*
Advised Elective[6]	3
Advised Elective[6]	3
Landscape Concentration[4]	3
Landscape Concentration[4]	3
Free Elective	3
	15

Spring Semester	*Credits*
Humanities/Soc. Sci. Elective[2]	3
Landscape Concentration[4]	3
Studio[5]	6
Free Elective	3
	15

Minimum Hours Required for Graduation ...130[7]

[1] May include any of the courses on the departmental listing of courses acceptable towards this requirement.

[2] The university requires 18 hours in humanities/social science area. The courses are to show a distribution between the social sciences and humanities. For further clarification, see the departmental listing of courses acceptable towards this requirement.

[3] Must include BS 100 or BO 200. The second science requirement may be met by taking 4 credit hours from the following courses: SSC 200 or MEA 101 or MEA 110 or MEA 120.

[4] *Landscape Concentrations:* 27 credit hours required which *must* include the following courses (15 credit hours): LAR 430, LAR 457, LAR 433, LAR 443 *or* LAR 444, and HS 211 *or* HS 212. The remaining 12 credit hours may be chosen from: HS 211 *or* HS 212, HS 342, HS 416, DN 221, DN 222, DN 421, DN 423, LAR 495, DN 495, SSC 200, SSC 361, MEA 101, MEA 110 *or* 120, MEA 208, MEA 300, BO 360, HS 531 or any LAR 500 level course open to undergraduate students.

[5] A minimum of four 400 level studios are required with a minimum of 3 of the 4 being LAR 400; however, one of the LAR 400 studios may be satisfied by HS 400. Studios may be taken any time during the final six semesters; however, no more than one studio may be taken in any semester.

[6] Advised electives are to be selected in consultation with the student's advisor. Six hours of the required twelve must include courses from one of the programs within the School of Design. They may not include credit for military science (AS, MS), music (MUS) below 200 level, or physical education.

[7] In order to receive two degrees from the School of Design, a student must complete 30 credit hours above the 130 requirement. These 30 hours are to include 18 credits in 400 level studio and 12 credits in landscape concentration from courses described above.

PRODUCT/VISUAL DESIGN

Brooks Hall

Professor Haig Khachatoorian, *Head of the Department*

Alumni Distinguished Undergraduate Professor: V. M. Foote

Professor M. Davis, V. M. Foote, A. Lowrey; *Associate Professors:* A. V. Cooke, M. Lange, P. L. Middleton, S. Wilchins, J. Wittkamp; *Adjunct Associate Professor:* A. Merino; *Assistant Professors:* S. Ater, A. Kallish.

Upon completion of design fundamentals requirements, the student selecting the Product Visual Design Department elects as a major area of concentration either product or visual design. **Product Design** is concerned with all the human aspects of machine-made products and their relationship to the environment. This design discipline is often referred to as industrial design. The designer is responsible for the product's human factors engineering, safety, shape, color, texture, maintenance and cost. Product design deals with consumer as well as industrial products. In order to achieve these ends, designers must be involved in three major design and research activities: human behavior; the human-machine relationship; and the product itself.

Areas of design investigation include furniture, housewares, appliances, transportation, tools, farm equipment, medical/electronic instruments, recreational support equipment and others.

Graduates with a Bachelor of Environmental Design in Product Design have career opportunities in three general areas: corporate design offices in manufacturing companies, independent consulting offices, or governmental agencies.

Visual Design, often referred to as graphic design, is concerned with all aspects of visual communication. The increasing importance of communication in our society has created a demand for designers, who have operational knowledge and creative abilities in various visual media. The elements of this field were historically found in various crafts/skills, commercial and production art. These have been integrated into a new design discipline; and the scope of educational development includes typography, photography, illustration, printing, production materials and methods. The applications include publication design (books, pamphlets and brochures), package design, sign and symbol design, advertising design (including newspapers, magazines, television and cinema), exhibit and display design. To achieve a broader view of the environment, the discipline analyzes the visual character of our urban environment and its relation to social and behavioral functions, and explores visual solutions to socially defined problems. Through a broad range of creative experiences, the student develops an understanding of the elements and principles of organization common to all visual communication.

Graduates with a Bachelor of Environmental Design in Visual Design have career opportunities in professional design offices, corporate design offices, advertising agencies, corporations involved in printing, production, media development and communication.

Within the Product/Visual Design Department, there is an additional concentration—**Textile Design**. Courses in this concentration are offered by both the School of Design and the College of Textiles. The program provides a strong awareness of the constraints of the textile industry and the requirements of the retail trade through appropriate project work, seminars and associated field trips. While offering a good general education that incorporates aesthetics, technology and economics in the context of a particular industry, the concentration is particularly appropriate for people who wish to become practicing textile designers, either in an industrial setting or in private practice.

PRODUCT DESIGN CURRICULUM

Degree: Bachelor of Environmental Design in Product Design

FRESHMAN YEAR

Fall Semester	*Credits*
DF 101 Design Fundamentals Studio I	6
ENG 111 Composition & Rhetoric	3
PE 100 Health and Physical Fitness	1
Humanities/Soc. Sci. Elective[4]	3
Math Elective[1]	3
	16

Spring Semester	*Credits*
DF 102 Design Fundamentals Studio II	6
ENG 112 Composition & Reading	3
Humanities/Soc. Sci. Elective[4]	3
Math Elective[1]	4-3
Physical Education	1
	16-17

SOPHOMORE YEAR

Fall Semester	*Credits*
PD 255 Contemp. Mfg. Processes I[5]	3
PD 318 Ideation I[5]	3
Natural Science Elective[3]	4
Studio[2]	6
Physical Education	1
	17

Spring Semester	*Credits*
PD 256 Contemp. Mfg. Processes II[5]	3
PD 418 Ideation II[5]	3
Natural Science Elective[3]	4
Studio[2]	6
Physical Education	1
	17

JUNIOR YEAR

Fall Semester	*Credits*
Core[5]	3
Core[5]	3
Core[5]	3
Humanities/Soc. Sci. Elective[4]	3
Studio[2]	6
	18

Spring Semester	*Credits*
Core[5]	3
Core[5]	3
Humanities/Soc. Sci. Elective[4]	3
Studio[2]	6
	15

SENIOR YEAR

Fall Semester	*Credits*
Core[5]	3
Humanities/Soc. Sci. Elective[4]	3
Studio[2]	6
Free Elective	3
	15

Spring Semester	*Credits*
Humanities/Soc. Sci. Elective[4]	3
Studio[2]	6
Free Elective	3
Free Elective	3
	15

Minimum Hours Required for Graduation ...129[6]

[1]Must include one calculus course and may include any of the courses on the departmental listing of courses acceptable towards this requirement.

[2]A minimum of six 400 series studios are required with a minimum of four of the six being PD. No more than one studio may be taken in any semester.

[3]Selected from natural, physical, or biological sciences, but not to include math or computer science courses. For further clarification, see departmental listing of courses acceptable towards this requirement.

[4]The university requires 18 hours in humanities/social science area. At least 6 of the 18 hours must be in humanities and at least 6 of the 18 must be in social sciences. For further clarification, see the departmental listing of courses acceptable towards this requirement.

[5]Each student is required to take a minimum of 30 credit hours which are to be selected from the six cores (Graphics and Communications, Behavior, Environment, History and Philosophy, Physical Elements and Systems, and Methods and Management). *Note:* PD 255, 256, 318, and 418 are required as part of the 30 credit hours. A student in this program must have a product design faculty member as an advisor.

[6]In order to receive two degrees from the School of Design, a student must complete 30 credit hours above the 129 hour requirement. These 30 hours are to include 18 credits in 400 level studio and 12 credits in core courses above those described above.

VISUAL DESIGN CURRICULUM

Degree: Bachelor of Environmental Design in Visual Design

FRESHMAN YEAR

Fall Semester	*Credits*
DF 101 Design Fundamentals Studio I	6
ENG 111 Composition & Rhetoric	3
PE 100 Health and Physical Fitness	1
Humanities/Soc. Sci. Elective[4]	3
Math Elective[1]	3
	16

Spring Semester	*Credits*
DF 102 Design Fundamentals Studio II	6
ENG 112 Composition & Reading	3
Humanities/Soc. Sci. Elective[4]	3
Math Elective[1]	4-3
Physical Education Elective	1
	17-16

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
VD 217 Typography I[5]	3	VD 317 Typography II[5]	3
VD 455 Visual Design Mat'ls & Proc. I[5]	3	VD 456 Visual Design Mat'ls & Proc. II[5]	3
Natural Science Elective[3]	4	Natural Science Elective[3]	4
Studio[2]	6	Studio[2]	6
Physical Education Elective	1	Physical Education Elective	1
	17		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Core[5]	3	Core[5]	3
Core[5]	3	Core[5]	3
Core[5]	3	Humanities/Soc. Sci. Elective[4]	3
Humanities/Soc. Sci. Elective[4]	3	Studio[2]	6
Studio[2]	6		15
	18		

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Core[5]	3	Humanities/Soc. Sci. Elective[4]	3
Humanities/Soc. Sci. Elective[4]	3	Studio[2]	6
Studio[2]	6	Free Elective	3
Free Elective	3	Free Elective	3
	15		15

Minimum Hours Required for Graduation ...129[6]

[1]Must include one calculus course and may include any of the courses on the departmental listing of courses acceptable towards this requirement.

[2]A minimum of six 400 series studios are required with a minimum of four of the six being VD. No more than one studio may be taken in any semester.

[3]Selected from natural, physical, or biological sciences, but not to include math or computer science courses. For further clarification, see departmental listing of courses acceptable towards this requirement.

[4]The university requires 18 hours in social science/humanities area. The courses are not limited to any specific department but are to show a distribution between the social sciences and humanities. For further clarification, see the departmental listing of courses acceptable towards this requirement.

[5]Each student is required to take a minimum of 30 credit hours which must include VD 217, 317, 455, and 456. The remaining 18 credits are to be selected from the six cores (Graphics and Communications, Behavior, Environment, History and Philosophy, Physical Elements and Systems, and Methods and Management). A student in this program must have a visual design faculty member as an advisor.

[6]In order to receive two degrees from the School of Design, a student must complete 30 credit hours above the 129 hour requirement. These 30 hours are to include 18 credits in 400 level studio and 12 credits in core courses beyond those described above.

COLLEGE OF EDUCATION AND PSYCHOLOGY

Poe Hall

J. J. Michael, *Dean*

H. A. Exum, *Associate Dean*

R. T. Williams, *Associate Dean*

C. K. Jones, *Director of Teacher Education*

A. P. Smith, *Director of Student Services*

The College of Education and Psychology is concerned with the problems of human development from both psychological and educational perspectives. With emphases upon the preparation of middle grades, secondary, and post-secondary teachers, counselors,

supervisors, administrators and psychologists, the college seeks students who are dedicated to the improvement of human beings through education and service and who are sensitive to the complexity of teaching/learning processes. The college is composed of the Departments of Adult and Community College Education, Counselor Education, Curriculum and Instruction, Educational Leadership and Program Evaluation, Mathematics and Science Education, Occupational Education and Psychology.

Undergraduate degree programs are offered in agricultural education, education general studies, health occupations education, marketing education for teachers, mathematics education, science education, technical education, technology education, vocational industrial education, and psychology. In addition to being admitted to a curriculum, all teacher education candidates must meet program requirements for admission to candidacy in teacher education (including a 2.500 or higher overall grade point average after the sophomore year) and for admission to student teaching (including a 2.500 or higher GPA overall and in one's teaching field).

Graduates of the undergraduate programs in education receive a Bachelor of Science degree in education, and normally qualify for an "A" certificate to teach in their chosen field. Graduates of the undergraduate program in psychology receive a Bachelor of Arts in Psychology degree.

Seven degree programs (agricultural education, health occupations education, technology education, marketing education for teachers, mathematics education, science education, and vocational industrial education) named in the preceding paragraph lead to certification to teach in grades 9-12. In addition, the College of Education and Psychology offers middle grades degree programs (and certification for grades 6-9) with concentrations in language arts, mathematics, science, and social studies. Students seeking this certification will graduate with one or two fields of concentration. All teacher education graduates also complete the equivalent of a second major, outside of education.

Professional education courses are provided for those students enrolled in the College of Humanities and Social Sciences who wish to become teachers of secondary English, French, Spanish, and social studies, with certification for grades 9-12. In the Humanities and Social Sciences section of this catalog, see the areas describing the teacher education options. Students enrolled in the College of Agriculture and Life Sciences or in science and mathematics departments may double-major in the College of Education and Psychology and also obtain a North Carolina secondary teacher's certificate.

Most of the college's teacher education programs are in fields of teacher shortage. Graduates have little difficulty finding teaching positions. Because of limited faculty resources, space in several programs is limited.

Most of the education and psychology disciplines listed in the following pages also offer graduate-level curricula. In addition, the College of Education and Psychology has graduate programs in:

Adult and Community College Education	Middle Grades Education
Counselor Education	Occupational Education
Curriculum and Instruction	Reading Education
Education Administration	Special Education

See the Graduate Catalog or contact faculty members for information on master's and doctoral programs.

Public school sixth-year (intermediate) certification programs are available in agricultural, occupational, and vocational industrial education; curriculum and instruction and supervision; administration; counseling; reading education; special education; mathematics and science education; and school psychology. All of the bachelor's level and graduate level certification programs are approved by the North Carolina State Board of Education. All of the teacher education programs are accredited by the National Council for the Accreditation of Teacher Education (NCATE).

The modern College of Education and Psychology building is named Poe Hall. It includes a Learning Resources Library, a Center for Learning Technologies, and an Instructional Computing Facility. The building houses laboratories for technology, reading, science, psychology, and guidance and testing activities, as well as a children's play area with an observation room.

SCHOLARSHIPS

The College of Education and Psychology has a scholarship program distinct from the campus Merits Awards Program. Over 20 scholarships are awarded to undergraduates each year, including several scholarships reserved for minority students.

North Carolina State University is one of 13 institutions participating in the N.C. Teaching Fellows Program and has over 250 teaching fellows enrolled. Each fellow receives $5,000 per year for four years, in exchange for a commitment to teach for four years in the state.

Other students hold the prestigious Paul Douglas Scholarship, or receive awards through the State Board of Education's Scholarship Loan Fund for Prospective Teachers and other sources. High school counselors receive information about, and applications for, all of these scholarships and awards.

SCHOLARS AND HONORS PROGRAMS

The College of Education and Psychology participates in the University Scholars Program, in which selected students each year participate in weekly activities that broaden and deepen their university experiences. The Psychology and Occupational Education Departments offer an optional curriculum for honors students. There is an honors society in psychology.

INTERNATIONAL ACTIVITIES

Several faculty members have been involved in overseas projects, in China, Japan, Peru, Puerto Rico, and Sri Lanka. Some of the foreign language teacher education students spend a year in France or Spain in an exchange program. The enrollment of international students in the several education and psychology programs, and elsewhere at N. C. State, also offers multi-cultural opportunities without one's leaving the campus.

AGRICULTURAL EDUCATION

Poe Hall (Room 602)

Associate Professor L. R. Jewell, *Coordinator of Advising*

Professor: G. E. Moore; *Professors Emeriti:* J. K. Coster, C. C. Scarborough; *Associate Professors Emeriti:* C. D. Bryant, J. R. Clary, T. R. Miller; *Assistant Professors:* J. L. Flowers, B. H. Kirby.

Agricultural education, in its broadest sense, encompasses areas of study which will enable one to participate effectively in planning, promoting and initiating educational programs in agriculture. A program leads to a Bachelor of Science degree and is designed to prepare teachers of vocational agriculture in the secondary schools, and in technical and community colleges. The demand for agricultural education teachers exceeds present supply. Graduates who obtain certification in the bachelor's program generally have a choice of positions in the Carolinas, Virginia, and throughout the nation.

AGRICULTURAL EDUCATION CURRICULUM

REQUIREMENTS

Major Field of Study		*Credits*
ANS 200	Introduction to Animal Science *or* PO 201 Poultry Science and Production	4
BAE 201	Shop Procedures and Management	3
FOR 252	Introduction to Forest Science	3
SSC 200	Soil Science	4
Plant Science Elective (Select from approved list of courses)		3
		17

Professional Education

ECI 451	Improving Reading in Secondary Schools	2
ELP 344	School and Society	3
EOE 101	Introduction to Occupational Education	1
EOE 207	Introduction to Teaching Occupational Education	3
EOE 322	Contemporary Vocational Agriculture	3
EOE 424	Planning Educational Programs	3
EOE 426	Methods of Teaching Agriculture	3
EOE 427	Student Teaching in Agriculture	8
EOE 492	Senior Seminar in Agricultural Education	1
		27

English Courses

ENG 111	Composition and Rhetoric	3
ENG 112	Composition and Reading	3
		6

Mathematics Courses

Mathematics (but not 101 or 111), Logic, or Statistics Electives	6

Humanities and Social Science Courses

EB 201	Economics I *or* EB 212 Economics of Agriculture	3
PSY 304	Educational Psychology	3
PSY 376	Developmental Psychology *or* PSY 476 Psychology of Adolescent Development	3
SOC 202	Principles of Sociology *or* SOC 241 Sociology of Agriculture and Rural Society	3
SOC 305	Racial and Ethnic Relations	3
	Communication Elective	3
	History Elective	3
	Literature Elective	3
		24

Physical and Biological Sciences

BS 100	General Biology	4
	Chemistry Elective	4
		8

Physical Education and Free Electives

PE 100	Health and Physical Fitness	1
	Physical Education Electives	3
	Free Electives	9
		13

Agricultural Specialty or Agricultural Electives	3-6

Concentrations

(Students are to select one concentration and complete the requirements as listed below)	18-24

Minimum Hours Required for Graduation	128-129

ANIMAL SCIENCE

ANS 200	Introduction to Animal Science	4
ANS 204	Feeds and Feeding	4
ANS 310	Basic Horse Husbandry	3
ANS 402	Beef Cattle Management *or* ANS 404 Dairy Cattle Management	3
ANS 403	Swine Management *or* ANS 410 Horse Science	3
GN 301	Genetics in Human Affairs	3
ZO 201	General Zoology	4
		24

BOTANY

BO 200	Plant Life	4
BO 360	Introduction to Ecology	3
BO 365	Ecology Lab	1
BO 400	Plant Diversity	4
BO 403	Systematic Botany	4
GN 301	Genetics in Human Affairs	3
ZO 221	Conservation of Natural Resources	3
		22

COMMUNICATION*

AC 311	Communication Methods and Media	3
AC 470	Agricultural Communications	3
COM (SP) 110	Public Speaking	3
COM (SP) 201	Theories of Persuasive Communication	3
COM (SP) 226	Introduction to Public Relations	3
COM (SP) 326	Public Relations Applications	3
COM (SP) 446	Problems in Public Relations	3
COM (SP) 456	Organizational Communication	3
		24

ECONOMICS

EB 303	Farm Management	3
EB 306	Agricultural Law *or* EB 307 Business Law	3
EB 311	Agricultural Markets	3
EB 313	Marketing Methods	3
EB 415	Farm Appraisal and Finance	3
EB 475	Comparative Economic Systems	3
Economics Elective		3
		21

HORTICULTURAL SCIENCE

BO 200	Plant Life	4
HS 201	Principles of Horticulture	3
HS 301	Plant Propagation	4
HS 371	Interior Plantscapes	3
HS 411	Nursery Management	3
HS 431	Vegetable Production	4
HS 440	Greenhouse Management	3
		24

SOCIOLOGY

ANT 252	Cultural Anthropology	3
SOC 204	Sociology of Family	3
SOC 205	Work: Occupations and Professions	3
SOC 301	Human Behavior	3
SOC 311	Community Relations	3
SOC 425	Juvenile Delinquency	3
		18

ZOOLOGY

BO 200	Plant Life	4
BO 360	Introduction to Ecology	3
BO 365	Ecology Lab	1
ZO 201	General Zoology	4
ZO 221	Conservation of Natural Resources	3
ZO 303	Vertebrate Zoology	4
ZO 353	Wildlife Management	3
		22

AGRICULTURAL EXTENSION EDUCATION CONCENTRATION

The Agricultural Education/Agricultural Extension option is designed to prepare individuals for extension agent positions. It is offered as a program track under the existing Bachelor of Science degree in Agricultural Education. Students are required not only to engage in classroom and laboratory studies on the North Carolina State University campus, but also to engage in a closely supervised practicum in the field. Students will be required to complete a ten-week field work experience in an extension office during their sophomore year and a full-semester practicum experience during their senior year.

*Note: Communication Concentration is not approved for Teacher Certification.

REQUIREMENTS

Major Field of Study	*Credits*
AC 311 Communication Methods and Media	3
BAE 201 Shop Procedures and Management	3
EB 303 Farm Management	3
FOR 252 Introduction to Forest Science	3
SSC 321 Water Management	4
Animal Science *or* Poultry Science Elective (Select from approved list)	4
Plant Science Elective (Select from approved list)	3
	23

Professional Education	
EAC 478 Extension as Non-Formal Education	3
EOE 101 Introduction to Occupational Education	1
EOE 226 Applications of Instructional Technology in Agricultural Education	3
EOE 307 Field Work in Occupational Education	3
EOE 323 Leadership Development in Agriculture	3
EOE 422 Public Relations in Agriculture	3
EOE 423 Practicum in Agricultural Extension/Industry	8
EOE 426 Methods of Teaching Agriculture	3
EOE 492 Senior Seminar in Agricultural Education	1
	28

English Courses	
ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
	6

Mathematics Courses	
Mathematics (but not 101 or 111), Logic, or Statistics Electives	6

Humanities and Social Science Courses	
PS 201 Introduction to American Government	3
PSY 304 Educational Psychology	3
EB 201 Economics I *or* EB 212 Economics of Agriculture	3
SOC 202 Principles of Sociology *or* SOC 241 Sociology of Agriculture and Rural Society	3
Communication Elective	3
History Elective	3
Humanities Elective (Select from approved courses)	3
Literature Elective	3
Social Science Elective (Select from approved courses)	3
	27

Physical and Biological Sciences	
BS 100 General Biology	4
CH 111 Foundations of Chemistry *or* PY 211 General Physics	4
	8

Physical Education and Free Electives	
PE 100 Health and Physical Fitness	1
Physical Education Electives	3
Free Electives	9
	13

Agricultural Electives	6
Agricultural Specialty	12
Minimum Hours Required for Graduation	129

EDUCATION, GENERAL STUDIES

Poe Hall (Room 608)

Associate Professor R. C. Serow, *Coordinator of Advising*

The Education, General Studies program has three areas of emphasis which serve the needs of the following groups of students: 1) those students who wish to seek a teaching certificate in fields not offered at North Carolina State University, but at another institution; 2) those students who wish to work in fields which do not require certification; e.g., employee in juvenile home, residential school, state or local education-related agencies, or a paraprofessional in schools; and 3) those students enrolled in a teacher education program at North Carolina State University whose career goals in education have changed. Students enrolled in a teacher education program, upon the recommendation of their department and approval of the College of Education and Psychology's Associate Dean for Academic Affairs, may transfer to this program.

REQUIREMENTS

GENERAL STUDIES	*Credits*
Communication Skills	9
English composition (ENG 111, 112)	
Communication (one course)	
Humanities	18
History (HI 205 and 233)	
Fine Arts (at least one course)	
Literature (English or American; at least one course)	
Philosophy (PHI 205)	
Social Sciences	12
Political Science or Economics (two-course sequence)	
Psychology (PSY 200)	
Sociology (SOC 202)	
Natural Sciences	7-8
Includes at least one laboratory course	
Mathematics	6-7
One mathematics course and an elective from mathematics, statistics, or computer science; but not MA 101 and MA 111	
Physical Education	4
PE 100 Health & Physical Fitness	
Three one-credit activity courses	
Electives	10-13
	66-71

MAJOR	*Credits*
Core Courses	
Introductory Course	3-4
EOE 101 and 365,* *or* 101 and 322,* *or* EMS 203, *or* ECI 205	
ELP 201 Alternative Education Agencies	3
ELP 344 School and Society	3
ELP 496 Special Topics in Education: General Studies	3
PSY 304 Educational Psychology	3
PSY 376, 475, *or* 476	3
	18-19

Emphasis 1 (Certification in teaching area not at N.C. State University)

COM (SP) 213 Oral Interpretation of Literature	3
ECI 483 Introduction to Media and Instructional Technology	3
PSY 310 *or* 320	3
Courses per agreement to be taken at a cooperating institution	18
Restricted Electives (An approved sequence in ED or PSY)	12
	39

Emphasis 2 (Noncertified position in education or related occupations)

COM (SP) 112 Interpersonal Communication	3
ECI 483 Introduction to Media and Instructional Technology	3
PSY 310 *or* 320	3
SOC 305 and 311	6
SOC 418 Sociology of Education	3
Restricted Electives (An approved sequence in ED or PSY)	21
	39

Emphasis 3 (Transfer from teacher certification to general studies program without certification)

Teaching field	30
Supporting courses	9
	39
Minimum Hours Required for Graduation	126

*These courses must be taken in sequence, with a total of 4 credits.

ENGLISH TEACHER EDUCATION

Associate Professor R. J. Pritchard, *Coordinator of English Education*

Assistant Professor C. A. Pope

Students desiring to become secondary English teachers in grades 9-12 will be enrolled in the College of Humanities and Social Sciences. In that college's section of this Catalog, curriculum requirements for the teacher education option can be found under English. Students desiring to become language arts teachers in grades 6-9 will be enrolled in the College of Education and Psychology. For details, consult the Middle Grades Education description.

FRENCH TEACHER EDUCATION

Assistant Professor L. Salstad, *Coordinator of Advising*

Lecturer D. Adler, *Assistant Coordinator of Advising*

Students desiring to become teachers of French will be enrolled in the College of Humanities and Social Sciences. In that college's section of this Catalog, curriculum requirements for the teacher education option in French can be found under Foreign Languages and Literatures.

GRAPHIC COMMUNICATIONS

Poe Hall (Room 510)

Lecturer G. K. Hilliard, Jr., *Coordinator, Graphic Communications*

Alumni Distinguished Undergraduate Professor: J. L. Crow

Assistant Professors: J. L. Crow, W. J. VanderWall; *Lecturers:* T. J. Branoff, J. F. Freeman, G. C. Gull, S. P. Markley, A. Y. Scales, E. N. Wiebe; *Lecturer Emeritus:* B. D. Webb.

A 15-hour minor is offered in Graphic Communications. The minor is designed to develop proficiency in selecting and applying graphic techniques in both career and leisure activities, to provide in-depth manual and computer graphics skills, and to enrich visual perception and critical thought in graphic areas. For additional information, consult the Graphic Communications Program, 510 Poe Hall (737-2234).

HEALTH OCCUPATIONS TEACHER EDUCATION

Poe Hall (Room 502)

Associate Professor H. D. Akroyd, *Coordinator of Advising*

Assistant Professor R. M. Patterson

The Health Occupations Teacher Education curriculum is designed to prepare qualified teachers for health occupations programs in secondary schools, community colleges, public health agencies, hospitals, and other health industry positions. Health Occupations Teacher Education offers a two track curriculum: 1) a certification track for those who desire teaching positions in the public secondary schools; and 2) a non-certification track for those not obtaining state secondary certification, but who desire positions within the health industry requiring education and supervisory skills. Both curriculum tracks are for students who have already developed competency in a health care specialty. Thirty hours of equivalency credit is granted by validation of a current credential in a health occupations specialty by the American Dental Association, American Medical Association-Committee on Allied Health Education and Accreditation, National League for Nursing, or Council on Professional Accreditation.

HEALTH OCCUPATIONS EDUCATION CURRICULUM

REQUIREMENTS

Major Field of Study

ECI 451	Improving Reading in Secondary Schools[1]	2
ELP 344	School and Society[1]	3
EOE 101	Introduction to Occupational Education	1
EOE 207	Introduction to Teaching Occup. Educ.[1]	3
EOE 331	Health Professions	3
EOE 332	Health Promotion and Disease Prevention	3
EOE 333	Health Care Delivery	3
EOE 335	Planning Classroom and Clinical Curricula	3
EOE 336	Strategies of Teaching a Health Occupation	3
EOE 338	Medical Law and Ethics	3
EOE 433	Health Occupations Specialty Practicum[2]	3
EOE 434	Clinical Supervision in Health Occupations[2]	3-6
EOE 436	Evaluative Skills in Teaching Health Occup.	3
EOE 437	Health Occupations Teaching Practicum[3]	3
Health Credential (Two years of education in an approved accredited health professions program)		3-8
		30
		61-68

English Courses

ENG 111	Composition and Rhetoric	3
ENG 112	Composition and Reading	3
		6

Mathematics Courses

MA Elective (not 101 or 111)		3
MA (not 101 or 111), Logic, or Statistics		3
		6

Humanities and Social Sciences

PSY 304	Educational Psychology[1]	3
PSY 376	Developmental Psychology *or*	
PSY 476	Psychology of Adolescent Development[1]	3
Communication Elective		3
History Elective[4]		3
Humanities/Social Science Electives[4]		12-18
Literature Elective[4]		3
		27

Natural Sciences

Natural Science Electives	8

Free Electives

To meet minimum total hours required for graduation 9-16

Minimum hours required for graduate 124

[1]Required only in the certification track.
[2]Required only in the non-certification track.
[3]Certification students must enroll for eight hours, non-certification students are required to have a minimum of three hours.
[4]Courses must be at the 300-400 level for students in the certification track.

INDUSTRIAL AND TECHNICAL EDUCATION

Poe Hall (Room 502)

Associate Professor R. E. Peterson, *Coordinator of Advising*

Professor Emeriti: D. M. Hanson, J. T. Nerden; *Associate Professor Emeritus:* F. S. Smith; *Assistant Professor Emeritus:* T. C. Shore.

The Industrial and Technical Education program offers curricula to prepare teachers, supervisors and administrators in trade and/or technical areas for the public schools, area vocational schools, community colleges and technical colleges. Completion of a four-year curriculum in vocational industrial education or technical education leads to the Bachelor of Science in education. The curricula are planned to provide students with broad cultural and professional backgrounds to parallel occupational experience.

VOCATIONAL INDUSTRIAL EDUCATION CURRICULUM

The curriculum in Vocational Industrial Education is designed to prepare Industrial Cooperative Training teachers for secondary schools and coordinators for post-secondary school cooperative education programs. Graduates who teach in secondary schools are also prepared to teach Introduction to Industrial Education, which is the entry-level Trade and Industrial Education orientation course in the public schools. These teachers prepare students for employment in a wide range of industries through a cooperative arrangement between the schools and employers where theory, related instruction, and coordination are provided by the school and practice is provided by industry. The VIE curriculum combines general education, professional education, and a range of technical education and other courses which help the prospective ICT teacher or coordinator to understand modern industry. This area is one which usually has a high demand for graduates of the program.

REQUIREMENTS

Major Field of Study

Academic

EB 201	Economics I	3
EB 202	Economics II	3
EB 307	Introduction to Business Law	3
EB 313	Marketing Methods	3
EB 326	Human Resource Management	3
EB 485	Management Development Seminar	3
	Economics Electives	6
		24

Technical

EOE 496	Senior Seminar in Industrial and Occupational Education	2
GC 120	Foundations of Graphics	3
GC 200	Applied Computer Aided Drawing	3
	Technical Electives	15
		23

Professional Education

ECI 451	Improving Reading in Secondary Schools	2
ELP 344	School and Society	3
EOE 101	Introduction to Occupational Education	1
EOE 207	Introduction to Teaching Occupational Education	3
EOE 303	Administration and Supervision of Student Org.	3
EOE 365	Trade Analysis in Course Development	3
EOE 404	Principles & Practices of Cooperative Education	3
EOE 466	Methods of Teaching Voc. Industrial and Technical Education	3
EOE 467	Student Teaching in Voc. Industrial and Technical Education	8
		29

English Courses

ENG 111	Composition and Rhetoric	3
ENG 112	Composition and Reading	3
		6

Mathematics Courses

MA Elective (not 101 or 111)		3
MA (not 101 or 111), Logic, or Statistics		3
		6

Humanities and Social Sciences

PHI 314	Issues in Business Ethics	3
PSY 304	Educational Psychology	3
PSY 376	Developmental Psychology *or*	
PSY 476	Psychology of Adolescent Development	3
SOC 205	Work: Occupations and Professions	3
Communication Elective		3
History Elective		3
Literature Elective		3
		21

Natural Sciences

CH 111	Foundations of Chemistry	4
Physics Elective		4
		8

Physical Education and Free Electives

PE 100	Health and Physical Fitness	1
Physical Education Electives		3
Free Electives		9
		13

Minimum Hours Required for Graduation 130

TECHNICAL EDUCATION CURRICULUM

The curriculum in technical education prepares instructors in a range of technologies. A strong mathematics and physics foundation is required. A student enrolling in the technical education curriculum may specialize in areas related to his/her technical preparation and/or previous work experience. Admission to the technical education curriculum is limited to students demonstrating proficiency in a given applied technology, i.e., electrical, electronics, mechanical, etc. Thus, the program is not open to high school graduates, who lack technical preparation and/or experience. Employment opportunities for technical education graduates include teaching in community and technical colleges and within industry as technical trainers and coordinators of training programs.

REQUIREMENTS

Major Field of Study		*Credits*
GC 120	Foundations of Graphics Communications	3
GC 200	Applied Computer Aided Drawing	3
EOE 301	Survey of Vocational Education	3
Technical Education Elective		3
Approved Electives[1]		15
		27

Professional Education

ECI 483	Introduction to Media and Instructional Technology	3
EOE 452	Lab Planning in Technology Education	3
EOE 101	Introduction to Occupational Education	1
EOE 365	Trade Analysis in Course Development	3
EOE 466	Methods of Teaching Vocational Industrial and Technical Education	3
EOE 467	Student Teaching Vocational Industrial and Technical Education	8
EOE 481	Introduction to Development Training	3
EOE 496	Senior Seminar in Industrial and Technical Education	3
		27

English Courses

ENG 111	Composition and Rhetoric	3
ENG 112	Composition and Reading	3
		6

Mathematics Courses

MA 111	Precalculus Algebra and Trigonometry (credits do not count toward graduation)	3
MA 141	Analytical Geometry and Calculus I	4
MA 241	Analytical Geometry and Calculus II	4
		11

Humanities and Social Science Courses

EB 201	Economics I	3
PS 201	Introduction to American Government	3
PSY 304	Educational Psychology	3
SOC 202	Principles of Sociology	3
SOC 205	Work: Occupational & Professional	3
	Communication Elective	3
	History Elective	3
	Humanities Elective	3
	Literature Elective	3
		27

Physical and Biological Sciences

CH 101	General Chemistry I	4
PY 205	Physics for Engineers and Scientists I *or*	
PY 211	College Physics I	4
PY 208	Physics for Engineers and Scientists II *or*	
PY 212	College Physics II	4
		12

Physical Education and Free Electives

PE 100	Health and Physical Fitness	1
	Physical Education Electives	3
	Free Electives	12
		16

Minimum Hours Required for Graduation ..... 123[2]

[1]Approved electives must be selected from engineering, engineering sciences, or physical sciences and related to student's specialization.

[2]Students required to demonstrate proficiency in an applied technology (may be fulfilled by technical school training) prior to admission to the program.

MARKETING EDUCATION FOR TEACHERS

Associate Professor J. L. Burrow, *Coordinator of Advising*

The Marketing Education curriculum is specifically designed to prepare teachers for Marketing Education programs in secondary schools. In addition, it provides the necessary pedagogical and technical preparation needed by marketing instructors in community and technical colleges, as well as for selected training and development roles in business and industry. The combination of a broad general and professional education, business and

marketing courses, and supervised work experience in marketing jobs provides a unique preparation for educators in a rapidly expanding occupational area.

REQUIREMENTS

Major Field of Study	*Credits*
Economics	
EB 201 Economics I	3
EB 202 Economics II	3
EB 307 Business Law I	3
EB 313 Marketing Methods	3
EB 326 Human Resource Management	3
EB 350 Economics and Business Statistics	3
EB 460 Marketing Research	3
EB 400-level Elective	3
	24
Marketing	
ACC 280 Managerial Accounting	3
BUS 466 Sales Management	3
BUS 467 Advertising and Sales Promotion	3
BUS 468 Marketing Management and Planning	3
CSC 200 Introduction to Computers and Their Uses	3
	15
Professional Education	
ECI 451 Improving Reading in Secondary Schools	2
ELP 344 School and Society	3
EOE 101 Introduction to Occupational Education	1
EOE 207 Introduction to Teaching Occupational Education	3
EOE 241 Foundations of Marketing Education	2
EOE 307 Field Work in Occupational Education	2-6
EOE 346 Curriculum and Methods of Teaching Marketing Education	3
EOE 444 Administration of Marketing Education	3
EOE 447 Student Teaching in Marketing Education	8
EOE 494 Senior Seminar in Marketing Education	3
	30
English Courses	
ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
	6
Mathematics Courses	
MA 114 Introduction to Finite Mathematics with Applications	3
Mathematics (not 101 or 111), Statistics, or Logic Elective	3
	6
Humanities and Social Science Courses	
PHI 314 Issues in Business Ethics	3
PSY 304 Educational Psychology	3
PSY 376 Human Growth and Development *or*	
PSY 476 Psychology of Adolescent Development	3
SOC 202 Principles of Sociology	3
Communication Elective	3
History Elective	3
Literature Elective	3
Political Science Elective	3
	24
Natural Sciences	
Natural Science Electives with Lab	8
Physical Education and Free Electives	
PE 100 Health and Physical Fitness	1
Physical Education Electives	3
Free Electives	9
	13
Minimum Hours Required for Graduation	126

MATHEMATICS AND SCIENCE EDUCATION

Poe Hall (Room 326)

Professor J. R. Kolb, *Interim Head of the Department*

Alumni Distinguished Undergraduate Professors: N. D. Anderson, J. R. Kolb, L. W. Watson

Professors: N. D. Anderson, L. M. Clark, J. R. Kolb; *Professor Emeritus:* H. E. Speece; *Associate Professors:* L. V. Stiff, W. M. Waters, Jr., L. W. Watson, J. H. Wheatley; *Associate Professor Emeritus:* H. A. Shannon; *Assistant Professors:* S. B. Berenson, K. S. Norwood, J. C. Park; *Adjunct Assistant Professors:* R. R. Jones, C. M. Meek, W. E. Spooner.

The Department of Mathematics and Science Education prepares undergraduate students to become teachers of mathematics and science. The department traditionally prepares competent professionals who have strong subject-matter backgrounds and pedagogical skills. Departmental majors may seek certification for teaching secondary grades 9-12 or middle grades 6-9. Students interested in teaching in the middle grades may select from mathematics or science as single concentrations, or a mathematics/science dual concentration earning double certification. Students in the 9-12 secondary curriculum in mathematics or science education may complete a double major and receive a second degree in mathematics or one of the sciences. All of the programs provide a broad background in the natural sciences, social sciences and humanities; depth in mathematics or an area of science; and the development of professional competencies.

SCHOLARSHIPS AND AWARDS

One merit award is available in mathematics education. In addition, the Speece Scholarship is awarded annually to as many as three outstanding juniors or seniors in either mathematics education or science education. The department sponsors a Mathematics and Science Education Club and recognizes the Outstanding Graduate in Mathematics Education and Science Education annually.

MATHEMATICS EDUCATION CURRICULUM (Grades 9-12 Certification)

REQUIREMENTS

General Studies (54-57 semester hours)	Credits
English and Communication Courses	
ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
Communication Elective	3
	9
Humanities and Social Sciences Courses[1]	
History Elective	3
Humanities Electives	6
Literature Elective	3
Social Science Electives	9
	21
Science Courses	
Physical Science[2]	8
Natural Science Elective[3]	3-4
	11-12
Physical Education and Free Electives	
PE 100 Health and Physical Fitness	1
Physical Education Electives	3
Free Electives[4]	9-12
	13-16

Teaching Major (42-45 semester hours)

Core Courses (required of all students)

CSC 101	Introduction to Programming	3
MA 141	Analytic Geometry and Calculus I	4
MA 225	Structure of the Real Number System *or*	
CSC (MA) 222	Applied Discrete Mathematics[5]	3
MA 241	Analytic Geometry and Calculus II	4
MA 242	Analytic Geometry and Calculus III	4
MA 408	Foundations of Euclidean Geometry	3
PHI 201	Logic	3
ST 101	Statistics by Example	3
		27

Specializations (choose one of these)

Mathematics

MA 341	Applied Differential Equations I	3
MA 403	Introduction to Modern Algebra	3
MA 405	Introduction to Linear Algebra and Matrices	3
MA 433	History of Mathematics	3
Math Elective[6]		3
		15

Computer Science

CSC 102	Programming Concepts	3
CSC 201	Basic Computer Organization and Assembly Language	3
CSC 311	Data Structures	3
CSC 322	Discrete Mathematical Structures *or*	
MA 403	Introduction to Modern Algebra	3
CSC Elective		3
MA 305	Elementary Linear Algebra *or*	
MA 405	Introduction to Linear Algebra and Matrices	3
		18

Statistics

MA 305	Elementary Linear Algebra *or*	
MA 405	Introduction to Linear Algebra and Matrices	3
MA 403	Introduction to Modern Algebra	3
ST 301	Statistical Methods I	3
ST 302	Statistical Methods II	3
ST 421	Introduction to Mathematical Statistics I	3
ST 422	Introduction to Mathematical Statistics II	3
		18

Professional Studies (required of all students) (31 semester hours)

ECI 451	Improving Reading in the Secondary Schools	2
ELP 344	School and Society	3
EMS 101	Orientation to Mathematics and Science Education	0
EMS 203	Introduction to Teaching Mathematics and Science	3
EMS 470	Methods and Materials for Teaching Mathematics[6]	3
EMS 471	Student Teaching in Mathematics[6]	8
EMS 472	Teaching Mathematics Topics in Senior High[7]	3
EMS 480	Teaching Mathematics with Microcomputers	3
PSY 304	Educational Psychology	3
PSY 476	Psychology of Adolescent Development	3
		31

Minimum Hours Required for Graduation 130

The humanities and social science electives must be chosen from the university's official list of courses. Many courses in philosophy, religion, literature, fine arts, history, and foreign language are approved humanities courses. Many courses in economics, sociology, anthropology, political science, psychology, and geography are approved social science courses. Specified courses in other areas such as communication, education, design, and university studies also are approved as humanities or social sciences. Students are encouraged to select courses in this curriculum area so that each of these areas is represented: economics, governmental systems, social systems, and fine arts.

[2]Must be a two-course sequence, with a laboratory, in chemistry or physics.

[3]May be in biological sciences, physical sciences, or marine, earth and atmospheric sciences.

[5]Students in the mathematics specialization are required to take 12 hours, while those in computer science and statistics are required to take 9 hours.

[4]MA 225 is required in all specializations except Computer Science.

[6]Mathematics elective must be at 200 level or above, or MA 105.

These courses are taken together as a block and completed prior to student teaching. Student teaching is full-time for ten weeks during the fall semester.

SCIENCE EDUCATION CURRICULUM
(Grades 9-12 Certification)

REQUIREMENTS

General Studies (40 semester hours) — **Credits**

English and Communication Courses

ENG 111 Composition and Rhetoric	3
ENG 112 Composition and Reading	3
Communication Elective	3
	9

Humanities and Social Sciences Courses[1]

History Elective	3
History or Philosophy of Science Elective	3
Humanities Elective	3
Literature Elective	3
Social Science Electives	6
	18

Physical Education and Free Electives

PE 100 Health and Physical Fitness	1
Physical Education Electives	3
Free Electives	9
	13

Specialization (59-63 semester hours)

Biology (59-61)

Specialization Courses

BO 200 Plant Life	4
BO 360 Introduction to Ecology	3
BO 365 Ecology Laboratory	1
BS 100 General Biology	4
GN 301 Genetics in Human Affairs *or*	
GN 411 Principles of Genetics	3
MB 401 General Microbiology *or*	
BCH 451 Introductory Biochemistry	4-3
ZO 201 General Zoology	4
ZO 421 Principles of Physiology *or*	
ZO 414 Cell Biology *or*	
BO 421 Plant Physiology	3
	25-26

Supporting Courses

CH 101 General Chemistry I	4
CH 103 General Chemistry II *or*	
CH 107 Principles of Chemistry	4
CH 220 Introductory Organic Chemistry *or*	
CH 221 Organic Chemistry I	4
MA 131 Analytic Geometry & Calculus A *or*	
MA 121 Elements of Calculus	4
MA 231 Analytic Geometry & Calculus B *or*	
ST 311 Introduction to Statistics	3
MEA 101 Geology I: Physical	3
MEA 110 Geology I Laboratory	1
PY 211 College Physics I	4
PY 212 College Physics II	4
Earth Science Elective	3-4
	34-35

Chemistry (61-62)

Specialization Courses

CH 101 General Chemistry I	4
CH 107 Principles of Chemistry	4
CH 221 Organic Chemistry I	4
CH 223 Organic Chemistry II	4
CH 315 Quantitative Analysis	4
CH 331 Intro. Physical Chemistry	4
CH 401 Systematic Inorganic chemistry *or*	
BCH 451 Introductory Biochemistry	3
	27

Supporting Courses

BS 100 General Biology	4
MA 141 Analytic Geometry & Calc. I	4
MA 241 Analytic Geometry & Calc. II	4
MA 242 Analytic Geometry & Calc. III	4
MEA 101 Geology I: Physical	3
MEA 110 Geology I Laboratory	1
PY 205 Physics for Engrs. & Sci. I	4
PY 208 Physics for Engrs. & Sci. II	4
Biological Science Elective	3-4
Earth Science Elective	3-4
	34-36

Earth Sciences (59-60)

Specialization Courses

MEA 101	Geology I: Physical	3
MEA 110	Geology I Laboratory	1
MEA 102	Geology II: Historical	3
MEA 111	Geology II Laboratory	1
MEA 130	Intro. to Weather & Climate *or*	
MEA 311	Physical Climatology	3
MEA 200	Introduction to Oceanography	3
MEA 330	Environmental Geology	3
MEA 331	Optical Mineralogy	4
MEA 451	Structural Geology	4
Earth Science Elective		3-4
		28-29

Supporting Courses

BS 100	General Biology	4
CH 101	General Chemistry I	4
CH 103	General Chemistry II *or*	
CH 107	Principles of Chemistry	4
MA 131	Analytic Geometry & Calc. A *and*	
MA 231	Analytic Geometry & Calc. B *or*	
MA 141	Analytic Geometry & Calc. I *and*	
MA 241	Analytic Geometry & Calc. II	7-8
PY 211	College Physics I	4
PY 212	College Physics II	4
Biological Science Elective		3-4
		30-32

Physics (61-63)

Specialization Courses

PY 201	University Physics I *and*	
PY 202	University Physics II *or*	
PY 205	Physics for Engrs. & Scientists I *and*	
PY 208	Physics for Engrs. & Scientists II	8
PY 223	Astronomy	3
PY 203	University Physics III *or*	
PY 407	Intro. to Modern Physics	3-4
Physics Electives[2]		10
		24-25

Supporting Courses

BS 100	General Biology	4
CH 101	General Chemistry I	4
CH 107	Principles of Chemistry	4
MA 141	Analytic Geometry & Calc. I	4
MA 241	Analytic Geometry & Calc. II	4
MA 242	Analytic Geometry & Calc. III	4
MA 341	Applied Differential Equations	3
MEA 101	Geology I: Physical	3
MEA 110	Geology I Laboratory	1
Biological Science Elective		3-4
Earth Science Elective		3-4
		37-39

Professional Studies (29 semester hours)

ECI 451	Improved Reading in Secondary Schools	2
ELP 344	School and Society	3
EMS 203S	Introduction to Teaching Mathematics and Science	3
EMS 475	Methods of Teaching Science[3]	3
EMS 476	Student Teaching in Science[3]	8
EMS 477	Instructional Materials in Science	2
EMS 495	Senior Seminar in Mathematics & Science Education	2
PSY 304	Educational Psychology	3
PSY 476	Psychology of Adolescent Development	3

Minimum Hours Required for Graduation 130

[1]The humanities and social science electives must be chosen from the university's official list of courses. Many courses in philosophy, religion, literature, fine arts, history, and foreign language are approved humanities courses. Many courses in economics, sociology, anthropology, political science, psychology, and geography are approved social science courses. Specified courses in other areas such as communication, education, design, and university studies also are approved as humanities or social sciences. Students are encouraged to select courses in this curriculum area so that each of these areas is represented: economics, governmental systems, social systems, and fine arts.

[2]PY 411, 413, 414, and 452 are recommended.

[3]These courses are taken together as a block and completed prior to student teaching. Student teaching is full-time for ten weeks in the fall semester.

MIDDLE GRADES EDUCATION

Associate Professor C. L. Harper, *Coordinator*

The Middle Grades Education program seeks to prepare teachers who can effectively instruct young adolescents and be responsive to their unique needs, interests and abilities. Graduates may seek certification for teaching in grades 6-9 in two subject disciplines: language arts/social studies or mathematics/science. Students specializing in language arts/social studies are advised by the Department of Curriculum and Instruction. Students specializing in mathematics/science are enrolled in and advised by the Department of Mathematics and Science Education. Students who wish to become certified in only

mathematics or science teaching at the middle grades level must enroll in a special track in a mathematics education or science education degree program.

LANGUAGE ARTS AND SOCIAL STUDIES EDUCATION—DUAL CONCENTRATION (6-9 Certification)

REQUIREMENTS

General Studies (50 semester hours) — **Credits**

English and Communication Courses

ENG 111	Composition and Rhetoric	3
ENG 112	Composition and Reading	3
	Communication Elective	3
		9

Natural Sciences Courses

	Two courses of laboratory science	8

Mathematics Courses

	One mathematics course and an elective from mathematics, computer science or statistics, but excluding MA 101 and MA 111	6

Humanities and Social Science Courses

HI 205	Western Civilization Since 1400 *or*	
HI 233	The World in the 20th Century	3
HI 251	Early American History *or*	
HI 252	Modern American History	3
	American Literature Electives	6
	Anthropology *or* Sociology Elective	3
	Economics Elective	3
	Political Science Elective	3
		21

Physical Education Courses

PE 100	Health and Physical Fitness	1
PE 280	Emergency Medical Care and First Aid *or*	
PE 285	Personal Health	2
	Three one-credit PE electives	3
		6

Free Electives (9 semester hours)

Professional Education (39 semester hours)

ECI 102	Orientation to Middle Grades Education	0
ECI 205	Introduction to Teaching Humanities and Social Sciences	3
ECI 306	Middle Years Reading	3
ECI 309	Teaching in the Middle Years	3
ECI 415	The Arts and Adolescence	3
ECI 416	Teaching Exceptional Students in the Mainstreamed Classroom	3
ECI 430	Methods & Materials for Teaching Language Arts in the Middle Grades	4
ECI 435	Methods & Materials for Teaching Social Studies in the Middle Grades	4
ECI 454	Student Teaching in English/Language Arts	4
ECI 464	Student Teaching in Social Studies	4
ELP 344	School and Society	3
PSY 304	Educational Psychology	3
PSY 476	Psychology of Adolescent Development	3
		40

Teaching Concentrations (30 semester hours)

Language Arts

ECI 307 Teaching Writing Across the Curriculum 3
ECI (ENG) 405 Literature for Adolescents 3
ENG 262 English Literature II 3
ENG 322 Advanced Composition and Rhetoric *or*
ENG 324 Modern English 3
Literature Elective 3
Under General Studies and Professional Education
ECI 306 Middle Years Reading 3
American Literature courses 6
Communication Elective 3

Social Studies

ECI 200 Principles of Teaching Geography 3
HI 275 Introduction to History of South and East Africa *or*
HI 276 Introduction to History of West Africa 3
HI 364 History of North Carolina 3
EB Elective 3
HI Elective 3
Under General Studies
HI 205 West. Civ. Since 1400 *or*
HI 233 The World in the 20th Century 3
HI 251 Early American History *or*
HI 252 Modern American History 3
Anthropology or Sociology Elective 3
Political Science Elective 3

Minimum Hours Required for Graduation 129

Note. Students should consult the Department of Curriculum and Instruction for detailed information as to which courses will satisfy program requirements.

MATHEMATICS AND SCIENCE EDUCATION— DUAL CONCENTRATION (Grades 6-9 Certification)

REQUIREMENTS

General Studies (43 semester hours) **Credits**

English and Communication Courses

ENG 111 Composition and Rhetoric 3
ENG 112 Composition and Reading 3
Communication Elective 3
9

Humanities and Social Sciences Courses[1]

History Elective 3
Humanities Electives 6
Literature Elective 3
Social Science Electives 9
21

Physical Education and Free Electives

PE 100 Health and Physical Fitness 1
Physical Education Electives 3
Free Electives 9
13

Teaching Major (46-48 semester hours)

BS 100 General Biology 4
CH 101 General Chemistry I 4
CH 103 General Chemistry II 4
CSC 101 Introduction to Programming *or*
CSC 200 Introduction to Computers & Their Uses 3
Life Science Elective 3-4
MA 114 Introduction to Finite Mathematics & Applications 3
MA 131 Analytic Geometry & Calc. A *and*
MA 231 Analytic Geometry & Calc. B *or*
MA 141 Analytic Geometry & Calc. I *and*
MA 241 Analytic Geometry & Calc. II 7-8

MA 225 Structure of the Real Number System *or*
MA 403 Introduction to Modern Algebra 3
MA 408 Foundations of Euclidean Geometry 3
MEA 101 Geology I: Physical 3
MEA 110 Geology I Laboratory 1
Statistics Elective *or*
MA 105 Mathematics of Finance 3
PY 221 College Physics 5

Professional Studies (39 semester hours)

ECI 306 Middle Years Reading 3
ECI 309 Teaching in the Middle Years 3
ECI 415 The Arts and Adolescence 2
ELP 344 School and Society 3
EMS 203 Introduction to Teaching Mathematics and Science 3
EMS 470 Methods and Materials for Teaching Mathematics 3
EMS 471 Student Teaching in Mathematics[2] 1
EMS 474 Teaching Mathematics Topics in the Middle Years[2] 3
EMS 475 Methods of Teaching Science[2] 3
EMS 476 Student Teaching in Science[2] 4
PE 280 Emergency Medical Care and First Aid *or*
PE 285 Personal Health 2
PSY 304 Educational Psychology 3
PSY 476 Psychology of Adolescent Development 3

Minimum Hours Required for Graduation 128

[1]The humanities and social science electives must be chosen from the university's official list of courses. Many courses in philosophy, religion, literature, fine arts, history, and foreign language are approved humanities courses. Many courses in economics, sociology, anthropology, political science, psychology, and geography are approved social science courses. Specified courses in other areas such as communication, education, design, and university studies also are approved as humanities or social sciences. Students are encouraged to select courses in this curriculum area so that each of these areas is represented: economics, governmental systems, social systems, and fine arts.
[2]These courses are taken together as a block and completed prior to student teaching. Student teaching is full-time for ten weeks in the fall semester.

MATHEMATICS EDUCATION CURRICULUM (Grades 6-9 Certification)

REQUIREMENTS

General Studies (54 semester hours) **Credits**

English and Communication Courses

ENG 111 Composition and Rhetoric 3
ENG 112 Composition and Reading 3
Communication Elective 3
9

Humanities and Social Sciences Courses[1]

History Elective 3
Humanities Electives 6
Literature Elective 3
Social Science Electives 9
21

Science Courses

Physical Science[2] 4
Natural Science Elective[3] 4
8

Physical Education and Free Electives

PE 100 Health and Physical Fitness 1
Physical Education Electives 3
Free Electives 12
16

Teaching Major (35 semester hours)

CSC 101	Introduction to Programming	3
CSC 102	Programming Concepts	3
MA 105	Mathematics of Finance	3
MA 114	Introduction to Finite Mathematics with Applications	3
MA 141	Analytic Geometry & Calc. I	4
MA 241	Analytic Geometry & Calc. II	4
MA 225	Structure of the Real Number System *or*	
MA 403	Introduction to Modern Algebra	3
MA 408	Foundations of Euclidean Geometry	3
MA 433	History of Mathematics	3
PHI 201	Logic	3
Statistics Elective		3
		35

Professional Studies (39 semester hours)

ECI 306	Middle Years Reading	3
ECI 309	Teaching in the Middle Years	3
ECI 415	The Arts and Adolescence	2
ELP 344	School and Society	3
EMS 101	Orientation to Mathematics and Science Education	0
EMS 203	Introduction to Teaching Humanities and Social Science	3
EMS 470	Methods & Materials for Teaching Mathematics	3
EMS 471	Student Teaching in Mathematics[4]	8
EMS 474	Teaching Mathematics Topics in the Middle Grades[4]	3
EMS 480	Teaching Mathematics with Microcomputers	3
PE 280	Emergency Medical Care and First Aid *or*	
PE 285	Personal Health	2
PSY 304	Educational Psychology	3
PSY 476	Psychology of Adolescent Development	3

Minimum Hours Required for Graduation 128

[1]The humanities and social science electives must be chosen from the university's official list of courses. Many courses in philosophy, religion, literature, fine arts, history, and foreign language are approved humanities courses. Many courses in economics, sociology, anthropology, political science, psychology, and geography are approved social science courses. Specified courses in other areas such as communication, education, design, and university studies also are approved as humanities or social sciences. Students are encouraged to select courses in this curriculum area so that each of these areas is represented: economics, governmental systems, social systems, and fine arts.
[2]Physical science must be a course in either chemistry or physics, with a laboratory.
[3]May be a course in either the biological sciences or marine, earth and atmospheric sciences, with a laboratory.
[4]These courses are taken together as a block and completed prior to student teaching. Student teaching is full-time for ten weeks during the fall semester.

SCIENCE EDUCATION CURRICULUM (Grades 6-9 Certification)

REQUIREMENTS

General Studies (50 semester hours) **Credits**

English and Communication Courses

ENG 111	Composition and Rhetoric	3
ENG 112	Composition and Reading	3
Communication Elective		3
		9

Humanities and Social Sciences Courses[1]

Literature Elective		3
History Elective		3
Humanities Electives		9
Social Science Electives		9
		24

Mathematics Courses

MA 121	Elements of Calculus *or*	
MA 131	Analytic Geometry and Calculus A	4
MA 231	Analytic Geometry and Calculus B *or*	
ST 311	Introduction to Statistics	4-3
		7-8

Physical Education and Free Electives

PE 100 Health and Physical Fitness	1
Physical Education Electives	3
Free Electives	9
	13

Teaching Major (37 semester hours)

BO 200 Plant Life	4
BS 100 General Biology	4
CH 101 General Chemistry I	4
CH 103 General Chemistry II *or*	
CH 107 Principles of Chemistry	4
MEA 101 Geology I: Physical	3
MEA 110 Geology I Laboratory	1
ZO 201 General Zoology	4
Earth Science Elective	3
Physics Electives	6-8
Science Elective	3

Professional Studies (38 semester hours)

ECI 306 Middle Years Reading	3
ECI 309 Teaching in the Middle Years	3
ECI 415 The Arts and Adolescence	2
ELP 344 School and Society	3
EMS 203 Introduction to Teaching Mathematics and Science	3
EMS 475 Methods of Teaching Science[2]	3
EMS 476 Student Teaching in Science[2]	8
EMS 477 Instructional Materials in Science[2]	2
EMS 495 Senior Seminar in Mathematics and Science Education	3
PE 280 Emergency Medical Care and First Aid *or*	
PE 285 Personal Health	2
PSY 304 Educational Psychology	3
PSY 476 Psychology of Adolescent Development	3

Minimum Hours for graduation 128

[1]The humanities and social science electives must be chosen from the university's official list of courses. Many courses in philosophy, religion, literature, fine arts, history, and foreign language are approved humanities courses. Many courses in economics, sociology, anthropology, political science, psychology, and geography are approved social science courses. Specified courses in other areas such as communication, education, design, and university studies also are approved as humanities or social sciences. Students are encouraged to select courses in this curriculum area so that each of these areas is represented: economics, governmental systems, social systems, and fine arts.

[2]These courses are taken together as a block and completed prior to student teaching. Student teaching is full-time for ten weeks during the fall semester only.

PSYCHOLOGY

Poe Hall (Room 640)

Professor P. W. Thayer, *Head of the Department and Coordinator of Advising*

Alumni Distinguished Undergraduate Professors: K. W. Klein, D. H. Mershon

Professors: J. W. Cunningham, D. W. Drewes, T. E. LeVere, S. E. Newman, B. W. Westbrook; *Adjunct Professor:* J. L. Howard; *Professors Emeriti:* K. L. Barkley, H. M. Corter, J. C. Johnson, H. G. Miller; *Associate Professors:* J. L. Cole, W. P. Erchul, D. O. Gray, T. M. Hess, P. F. Horan, J. W. Kalat, K. W. Klein, J. E. R. Luginbuhl, D. H. Mershon, S. B. Pond, F. J. Smith, S. S. Snyder, N. W. Walker; *Adjunct Associate Professors:* B. F. Corder, J. Lawrence; *Associate Professors Emeriti:* M. L. Pitts, R. F. Rawls; *Assistant Professors:* L. E. Baker-Ward, R. W. Barnes-Nacoste, C. C. Brookins, S. A. Converse, M. E. Haskett; *Adjunct Assistant Professors:* M. Y. Bingham, B. Braddy, A. D. Hall, C. L. Kronberg; *Associate Members of the Faculty:* C. D. Korte (Multidisciplinary Studies), R. G. Pearson (Industrial Engineering), J. L. Wasik (Statistics).

Psychology is one of the basic university disciplines. Mastery of some of the knowledge in psychology is necessary to practitioners in education, health, social service, social sciences and managerial professions. Students holding the bachelor's degree in psychology and wishing to apply their psychological studies in a professional capacity generally continue their education in a graduate program such as applied or experimental psychology, or in

such fields as law, medicine, business, social work and a variety of other fields. Students in psychology may also choose to enter business or government, often without further training beyond the bachelor's degree. There are currently two different programs for undergraduate majors in psychology: the General Option (PSY), and the Human Resource Development Option (HRD). Each program emphasizes different aspects of the study of psychology. The following sections provide separate descriptions of these programs and their current requirements.

Within each of the options, there are honors tracks which provide special curricula and an opportunity for work with faculty on research projects. Students must have completed a minimum of 45 semester hours of course work (at least 15 at NCSU) and have a grade point average of 3.25 or better to be considered for admission to an honors program. More details as to admission and requirements are available from the Psychology Department.

All undergraduate majors are members of the Psychology Club, which provides a number of enrichment activities, including sponsorship of the Carolinas Psychology Conference. One of the largest undergraduate conferences in the United States, it is held annually in cooperation with Meredith College and other Cooperating Raleigh Colleges. There is also an active chapter of Psi Chi, the national psychology honor society, which provides enrichment to the program.

PSYCHOLOGY: GENERAL OPTION

The General Option is oriented toward the student who wants a broad understanding of the types of problems with which psychology is concerned and the ways in which psychologists approach and attempt to solve these problems. Curriculum requirements in the General Option are sufficiently flexible for students to concentrate, if they wish, in another area of study as well as psychology, and thereby prepare themselves for a variety of careers or professional graduate programs. By wise choice of elective courses, a student can prepare for medical, legal, business, or education graduate training, while at the same time acquiring a basic background in the social sciences.

REQUIREMENTS

Major Field of Study:	*Credits*
PSY 200 Introduction to Psychology	3
PSY (ST) 240 Intro. Research Methods I	3
PSY (ST) 241 Intro. Research Methods I Lab	1
PSY (ST) 242 Intro. Research Methods II	3
PSY (ST) 243 Intro. Research Methods II Lab	2
Two courses from Group 1:	6
PSY 300 Perception	
PSY 310 Learning and Motivation	
PSY 320 Cognitive Processes	
PSY 330 Biological Psychology	
PSY 505 History and Systems of Psychology	
Three courses (one each from three different sets in Group 2):	9
PSY 307 or 340 Industrial Psychology or Ergonomics	
PSY 376, 475 or 476 Developmental Psychology	
PSY 370 or 470 Personality and Abnormal Psychology	
PSY 411 or 412 Social or Applied Psychology	
PSY 435 Introduction to Psychological Measurement	
PSY Electives	6
	33
English Courses	
ENG 111, 112 English Composition	6
ENG 331, 332, or 333, or COM (SP) 110, 112, 201, or 202	3
	9
Mathematics Courses	
Two mathematics courses (not MA 101, 103, 109 or 111)	6-7
One computer science course	2-3
	8-10

Humanities and Social Science Courses:

Two literature courses	6
Three history or social science courses	9
PHI 201, 311, 332, 335, 340 or 341	3
One other philosophy course	3
	21

Natural Science Courses:

BS 100 or 105	4
Two natural science courses (at least one with lab)	6-7
	10-11

Restricted Electives:

Five courses in an approved grouping related to student's future plans	15

Free Electives:

To meet minimum total hours required for graduation	21-24

Physical Education:

PE 100 Health & Physical Fitness	1
Three courses	3
Minimum Hours Required for Graduation	124

Students should consult the Psychology Department for detailed information as to which courses will satisfy mathematics, natural science, literature and social science requirements.

Required PSY—Group 1: two courses from PSY 300, 310, 320, 330
Required PSY—Group 2: one course from any three sets
PSY 307 or 340
PSY 376, 475 or 476
PSY 370 or 470
PSY 411 or 412
PSY 436

MINOR IN COGNITIVE SCIENCE

The Departments of Psychology and of Philosophy and Religion offer an interdisciplinary minor in cognitive science. The minor provides a general introduction to contemporary interdisciplinary research within the framework of the "computer model" mind, and offers the student the opportunity for in-depth study of selected topics such as the nature of human information processing, the acquisition and use of language, and machine intelligence.

To complete the minor, 15 hours are required, distributed as follows: PSY 320 (Cognitive Processes); PSY 340 (Environmental Ergonomics) *or* PSY 545 (Human Information Processing); PHI 331 (Philosophy of Language); PHI 332 (Philosophy of Psychology); PHI/PSY 425/525 (Introduction to Cognitive Science).

MINOR IN PSYCHOLOGY

The Psychology Department offers a minor in psychology to majors in any field except psychology. To complete the minor, eighteen hours of courses are required, six of these hours in the basic science of psychology, and nine in the applied aspects of psychology. PSY 200 is a required prerequisite. All must be passed with a grade of "C" or better.

PSYCHOLOGY: HUMAN RESOURCE DEVELOPMENT OPTION

The Human Resource Development (HRD) Option is designed to provide a groundwork of skills and experience for students who wish to enter human service careers with a B.A. degree. With appropriate curriculum modifications, the program can also provide a sound background for students who wish to go into advanced degree programs in psychology, management, personnel, social work, counselling, guidance, education, and other areas. Students interested in graduate school should confer with their advisors in order to plan an appropriate course of study.

The HRD Option focuses on enabling students to gain direct experience in the areas in which they would like to work. HRD students devote a semester to learning principles and skills related to working with human problems, and subsequently each HRD student

spends a semester working part-time or full-time in a job related to his/her own area of interest. The HRD Option accepts a maximum of 20 students each year. Interested students can apply for admission to HRD during their sophomore or junior year. Further information and application forms are available in the Psychology Department office.

REQUIREMENTS

Major Field of Study

PSY 200 Introduction to Psychology	3
PSY (ST) 240 Intro Research Methods I	3
PSY (ST) 241 Intro Research Methods I Lab	1
PSY (ST) 242 Intro Research Methods II	3
PSY (ST) 243 Intro Research Methods II Lab	2
PSY 210 Applied Psychology *or*	
PSY 412 Applied Psychological Research	3
PSY 350 HRD Skills	3
PSY 495 HRD Practicum	6-11
PSY 499 Individual Study in Psychology	4
PSY Electives	9
	37-42

English Courses

ENG 111, 112 English Composition	6
Two courses from ENG 331, COM (SP) 110, 112, 201 or 202	6
	12

Mathematics Courses:

Two mathematics courses (not MA 101, 103, 109, or 111)	6-7
One computer science	2-3
	8-10

Humanities and Social Science Courses:

Two literature courses	6
Three history or social science courses	9
PHI 201, 311, 335, 340 or 341	3
One other philosophy course	3
	21

Natural Science Courses:

BS 100 or 105	4
Two natural science courses (at least one with lab)	6-7
	10-11

Restricted Electives:

Three courses in an approved grouping related to student's future plans	9

Free Electives: As needed to meet minimum hours required for graduation 15-21

Physical Education:

PE 100 Health and Physical Fitness	1
Three courses	3
Minimum Hours Required for Graduation	124

Students should consult the Psychology Department for detailed information as to which courses will satisfy mathematics, natural science, literature, and social science requirements.

CURRICULUM DISPLAY

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BS 100 or 105 General Biology	4	ENG 112 Composition & Reading	3
ENG 111 Composition & Rhetoric	3	History or Social Science	3
PE 100 Health and Physical Fitness	1	Natural Science	3-4
PSY 200 Intro. to Psychology	3	Philosophy	3
Mathematics	4	Free Elective	3
	15	Physical Education Elective	1
			16-17

SOPHOMORE YEAR

Fall Semester	*Credits*
PSY 240 Intro. Behavioral Research I	3
PSY 241 Intro. Behavioral Res. I Lab	1
History or Social Science	3
Literature	3
Mathematics	3-4
Physical Education Elective	1
	14-15

Spring Semester	*Credits*
PSY 242 Intro. Behavioral Research II	3
PSY 243 Intro. Behavioral Res. II Lab	2
Computer Science	2-3
History or Social Science	3
Natural Science	3-4
Philosophy	3
Physical Education Elective	1
	17-19

JUNIOR YEAR

Fall Semester	*Credits*
PSY 210 *or* 412	3
PSY 350	3
PSY 495	3
COM (SP) 112	3
Restricted Elective	3
Free Elective	3
	18

Spring Semester	*Credits*
PSY 495	3-8
PSY 499	4
PSY Elective	3
Free Elective	3-6
	16-18

SENIOR YEAR

Fall Semester	*Credits*
Literature	3
PSY Elective	3
Restricted Elective	3
Free Electives	6
	15

Spring Semester	*Credits*
PSY Elective	3
Restricted Elective	3
Communication or Technical Writing	3
Free Electives	3-6
	12-15

Minimum Hours Required for Graduation 124

SOCIAL STUDIES TEACHER EDUCATION

Associate Professor C. W. Harper, *Coordinator of Advising*

Students desiring to become secondary social studies teachers in grades 9-12 will be enrolled in the College of Humanities and Social Sciences. Curriculum requirements for the teacher education options can be found under history, political science and public administration, and sociology and anthropology in that college's section. Students desiring to become social studies teachers in grades 6-9 will be enrolled in the College of Education and Psychology.

SPANISH TEACHER EDUCATION

Assistant Professor L. Salstad, *Coordinator of Advising*

Students desiring to become teachers of Spanish will be enrolled in the College of Humanities and Social Sciences. The curriculum requirements for the teacher education option in Spanish can be found under Foreign Languages and Literatures in that college's section.

TECHNOLOGY EDUCATION

Poe Hall (Room 300)

Associate Professor R. E. Peterson, *Coordinator of Advising*

Professor Emeritus: D. W. Olsen; *Associate Professor:* R. E. Wenig; *Associate Professors Emeriti:* W. L. Cox, Jr., T. B. Young; *Assistant Professors:* W. W. DeLuca, W. J. Haynie, III; *Assistant Professor Emeritus:* R. T. Troxler.

Technology arts education is a study of the materials, processes, and product of technology and industry. Students learn the safe and efficient use of tools, machines, and the characteristics of materials in various technology education laboratories. Products are designed and constructed, and systems of efficiently organizing and managing work are studied. Practical skills, and an understanding of the contributions and impacts of technology in society, are developed. The technology education curriculum provides a general technical background for a variety of employment opportunities including certification as a teacher for industrial arts and technology education programs in middle and high schools. A minor in technology education is available.

REQUIREMENTS

Major Field of Study		*Credits*
GC 120	Foundations of Graphics	3
GC 200	Applied Computer Aided Drawing	3
TED 115	Wood Processing	3
TED 122	Metal Technology	3
TED 221	Construction Technology	3
TED 246	Graphic Arts Technology	3
TED 359	Electrical Technology I	3
TED 360	Electrical Technology II	3
TED 384	Computer Applications in Industry	3
TED 430	Manufacturing Technology	3
TED 476	Transportation: Energy and Power Technology	3
		33

Professional Education		
ELP 344	School and Society	3
ECI 451	Improving Reading in Secondary Schools	2
EOE 101	Introduction to Occupational Education	1
EOE 207	Introduction to Teaching Occup. Educ.	3
EOE 452	Lab Planning in Technology Education	3
EOE 456	Curriculum and Methods in Technology Educ.	3
EOE 457	Student Teaching in Technology Education	8
EOE 495	Senior Seminar in Technology Education	3
		26

Academic Concentration 24
(Select courses from approved list)
Option 1—Economics
Option 2—Science/Technology/Society-Sociology
Option 3—Science/Technology/Society-Economics

English Courses		
ENG 111	Composition and Rhetoric	3
ENG 112	Composition and Reading	3
		6

Mathematics Courses		
MA	Elective (not 101 or 111)	3
MA	(not 101 or 111), Logic, or Statistics	3
		6

Humanities and Social Sciences

PSY 304 Educational Psychology	3
PSY 376 Developmental Psychology *or*	
PSY 476 Psychology of Adolescent Development	3
HI 341 Technology in History	3
Literature Elective	3
Communication Elective	3
	15

Natural Sciences

CH 111 Foundations of Chemistry	4
Physics Elective	4
	8

Physical Education and Free Electives

PE 100 Health and Physical Fitness	1
Physical Education Electives	3
Free Electives	9
	13

Minimum Hours Required for Graduation	131

MINOR IN TECHNOLOGY EDUCATION

The Technology Education minor provides students a blend of cognitive and psychomotor experiences that enhance the understanding of technology and allow development of fundamental skills in selected technical areas. Each student will select courses with the aid of an advisor from the Technology Education faculty. The minor requires a Graphic Communications course, fundamentals courses, and applications courses. The minor options allow students to pursue professional interests within an area of technology.

COLLEGE OF ENGINEERING

Page Hall (Rooms 118 and 120)

J. K. Ferrell, *Interim Dean*

T. H. Glisson, *Associate Dean for Academic Affairs*

B. Houck, *Director of Engineering Special Programs*

W. E. Isler, *Assistant Dean for Research Programs*

R. M. Turner, *Assistant Dean for Student Services*

H. Winston, *Assistant Dean for Academic Affairs*

Young men and women who seek a challenging technical career in research and development, design, construction, production, maintenance, technical sales, management, teaching, or other careers requiring a methodical, creative solution of problems, should consider an engineering or computer science education. At NCSU, the College of Engineering has a distinguished and internationally recognized faculty. The faculty, together with the curricula of the undergraduate and graduate programs, offer an opportunity for ambitious young men and women to become the leaders and prime movers of our increasingly technological world. Because of the great influence of science and technology on our everyday lives, today's engineer and computer scientist must be acutely aware of, and responsible for, the impact that his or her creations may have on society. In addition to safety, aesthetics, economics, and energy, today's technologist must consider environmental, sociological, and other "human concern" costs.

The college's 28,000 graduates may be found in widely diversified careers throughout the world. Most are practicing in the engineering profession, but because their education has equipped them well to deal with problems in a wide variety of fields, many College of Engineering graduates have become corporate presidents, leaders in government, lawyers, and medical doctors, to name a few.

The College of Engineering is organized into ten departments: Biological and Agricultural, Chemical, Civil, Electrical and Computer, Industrial, Materials Science and Engineering, Mechanical and Aerospace, Nuclear, and Textile Engineering and Science; and the Department of Computer Science. Fifteen undergraduate degree programs are offered in these ten departments. In addition, a degree program in Engineering is offered by special arrangement to the very few students who can clearly demonstrate the need for an individualized program of study. Most departments offer advanced studies leading to professional degrees, master's degrees and the Doctor of Philosophy degree. (See listing of graduate degrees offered.)

The College of Engineering requests and receives accreditation from the Accrediting Board for Engineering and Technology (ABET) for twelve of its undergraduate engineering degree programs. Accreditation insures that these programs satisfy the minimum requirements for acceptance by this nationally recognized agency for accrediting engineering degree programs. The program in computer science is accredited by The Computer Science Accreditation Commission (CSAC) of the Computing Sciences Accreditation Board (CSAB). All curricula and programs are designed to maintain the college's national and international reputation while meeting the needs of the people and industries of the state and region through effective instruction, competent research, and the development of new and meaningful contributions to scientific knowledge.

A Career Planning and Placement Center is maintained by the university to assist continuing students and graduating students to achieve their career goals.

UNDERGRADUATE CURRICULA AND DEGREES

Incoming engineering and computer science freshmen are enrolled in a basic program, Engineering Undesignated, for a period of one to two years. After successfully completing the Engineering Undesignated requirements, a student enters a specific degree program.

The first-year curriculum is common to all undergraduate degree programs in the college. Entering students receive assistance in planning an appropriate program of study and have available continued guidance from an academic adviser throughout their academic careers.

In order to be eligible to apply for admission into a degree program, Engineering Undesignated students must successfully complete at least 28 credit hours of courses, including the following: MA 141 and MA 241; PY 205; ENG 111; CH 101, and one of either CH 105/107 or CSC 110/112.

Bachelor of Science—The baccalaureate program provides preparation for entry into industry, government, business or private practice as well as graduate school. Graduates with a BS degree in engineering or computer science may be engaged in design, development, production/construction, sales, maintenance, or the planning, operation, or management of industrial units.

The undergraduate curricula offer programs of study leading to a bachelor's degree in aerospace engineering, biological and agricultural engineering, chemical engineering, civil engineering, civil engineering construction option, construction management, computer engineering, computer science, electrical engineering, engineering, furniture manufacturing and management, industrial engineering, materials science and engineering, mechanical engineering, nuclear engineering, and textile engineering. Graduation requirements include the satisfactory completion of the specified number of credit hours of required courses and electives in any one of the sixteen curricula. Students must also earn an overall grade point average of 2.0, and a grade point average of 2.0 in their major courses. The total number of required credits ranges from 129 to 137 semester hours.

Double Degree Programs—NCSU students may wish to earn a bachelor of science degree in *two fields* of *engineering or in computer science and an engineering field.* When the two courses of study are planned sufficiently early to optimize the student's time, it is often found that courses required in one field may be substituted for required courses in the second field. The humanities/social science, physics, mathematics, chemistry, English and physical education sequences are common to many fields. In addition, required courses in one field can be used as free electives in other fields. This type of double degree program can usually be completed in five years. Students interested in such a program should consult the Assistant Dean for Student Services, and the department heads of the two courses of study.

Other students may wish to *combine* a bachelor of science in *engineering or computer science* with a bachelor of science or bachelor of arts degree in *some other college at North Carolina State University.* As in the double engineering degree program, it is often found that courses required in one college may be substituted for courses required in a second college. When two academic programs are planned sufficiently early to optimize the student's time, this type of double degree program can usually be completed in five years. Students interested in such a program should contact either their Coordinator of Advising or the Assistant Dean for Student Services, and the Associate Dean for Undergraduate Programs in the college offering the second degree.

A limited number of freshmen students in the College of Engineering are selected to participate in the Benjamin Franklin Scholars program. In addition to their major courses, each Benjamin Franklin Scholar develops an individualized, five-year plan of work focused on a central theme in the humanities and social sciences. Students completing the program receive a Bachelor of Science in engineering or computer science and a Bachelor of Arts in Multidisciplinary Studies.

TRANSFER PROGRAM

Students with non-engineering degrees or one or more years of academic work completed at other institutions may apply for transfer admission to the College of Engineering through the University Admissions Office. Students are admitted from appropriate programs from four-year institutions, as well as junior and community colleges.

Students currently attending or anticipating attendance at other institutions are advised to contact the Assistant Dean for Student Services for information relative to transfer GPA required, transferable credits, etc.

PROFESSIONAL DEGREES IN ENGINEERING

The College of Engineering offers post-baccalaureate curricula leading to the degrees of Chemical Engineer, Civil Engineer, Electrical Engineer, Industrial Engineer, Materials Engineer, Mechanical Engineer, and Nuclear Engineer. These programs of study are designed to fit the needs of students desiring intensive specialization in a particular field, or additional work not ordinarily covered in the normal undergraduate curricula. For further details, see "PROFESSIONAL DEGREES."

PURCHASE OF COMPUTERS BY COLLEGE OF ENGINEERING STUDENTS

Prior to the 1990 fall semester, the College of Engineering will install the first phase of a student computing facility composed of stand alone engineering workstations. During their first semester, new freshmen in the college will enroll in a computer literary course, E 115, which will be taught using the workstations. Following their completion of E 115, it is expected that students will incorporate use of the workstations into all curricular areas, including the preparation of reports and papers in non-technical subjects.

In either the freshman or sophomore year, most students will take a course in computer programming and, thereafter, will increasingly use computers as an engineering tool. The college policy is that all of its students will be provided with the computer resources, time and equipment, which are required to successfully complete their course of study.

However, some students may find that owning a computer is beneficial in terms of convenience and ready access to computational capability. Since different departments within the college have different course and computer language requirements, the college recommends that new students who decide to purchase a personal computer should not do so until they have been admitted into a degree program.

INTERNATIONAL OPPORTUNITIES

The college is actively working to provide its students with opportunities for overseas work and study experience. In addition to the study abroad program which is available to all students at NCSU, College of Engineering students can participate in an exchange program with the Université de Technologie de Compiègne in Compiègne, France, or they can participate in the International Student program at Kingston Polytechnic in the Greater London area. Students interested in Japan can participate in one of several programs offered by EAGLE, the Engineering Alliance for Global Education.

HUMANITIES AND SOCIAL SCIENCES

Each student in the College of Engineering is required to take a minimum of 18 credit hours of humanities and social science courses. All of the courses used to satisfy the humanities and social science requirement must be taken from the College of Engineering list of approved courses. The courses will be distributed as designated below:

1. A beginning economics course, EB 201 or EB 212.
2. A course in the history of science or the philosophy of science. Suitable courses are shown on the following list.
   HI 321 Ancient and Medieval Science
   HI 322 Rise of Modern Science
   HI 341 Technology in History
   HI 480 History of the Scientific Revolution
   HI 481 History of the Life Sciences
   MDS (UNI) 301 Science and Civilization
   MDS (UNI) 302 Contemporary Science and Human Values
   PHI 340 Philosophy of Science
3. Two courses, at least one of which must be an advanced course, from one of the following humanities groups.
   Communication (COM(SP))
   English Language Literature (ENG)
   Foreign Language Literature (FL_, GRK, LAT)

History (HI)
Philosophy (PHI)
Religion (REL)

4. Two courses, at least one of which must be an advanced course, from one of the following social science groups.
   Anthropology (ANT)
   Economics (EB)
   Political Science (PS)
   Psychology (PSY)
   Sociology (SOC)
   Note: The beginning economics course specified in (1) may be used with an advanced economics course to satisfy the social science requirement (4) above. If so, an additional course must be completed and any course from the College of Engineering list of approved humanities and social science courses may be used for this purpose. Students may obtain a copy of the list from their Coordinator of Advising.

ENGINEERING SCHOLARS PROGRAM

The **Engineering Scholars Program** has as its goal the promotion of research and academic careers in engineering and computer science. Under the sponsorship of the College of Engineering, in cooperation with the Division of Student Affairs, Scholars begin by living together and participating in special educational seminars, cultural enrichment activities, and scholars sections for some coursework. In the sophomore year, Engineering Scholars begin research apprenticeships with faculty members throughout the College of Engineering. Additional information may be obtained by contacting departmental program representatives.

COOPERATIVE EDUCATION PROGRAM

This optional program is structured so that the student will alternate semesters of study with semesters of practical work during the sophomore and junior academic levels. The freshman and senior years are spent on campus, while the sophomore and junior academic levels are spread over a three-year period to permit the alternating of the academic semesters with work experience semesters. Students earn a salary while they are in industry, and they may earn a sufficient income to finance much of their college education. The co-op plan normally takes five years for completion during which time the student receives 12 to 18 months of industrial experience in their career field.

Students in all curricula in the College of Engineering may apply if they have a grade-point average of 2.25 or better. After a student has been accepted for employment, he or she is expected to maintain at least a 2.0 grade-point average. Application for admission into the co-op program should be made early in the spring semester of the freshman year; however, later applications resulting in fewer work semesters prior to graduation will be considered during the sophomore year or the first semester of the junior year. Engineering Undesignated students must be admitted into an engineering degree program prior to beginning the first co-op assignment. Further information may be obtained from the Office of Cooperative Education, 213 Peele Hall.

STUDENT ACTIVITIES

Each curriculum in the College of Engineering has a technical society open to every student enrolled in the curriculum. In most cases, these are student chapters of national professional organizations. Each curriculum also has one or more honor societies to give recognition to students who have earned superior academic records. In addition, there are college-wide honor, professional, and service societies that offer personally and educationally rewarding opportunities for students.

Student representatives of each curriculum serve on the Engineers' Council. The Council is the coordinating agency for college-wide activities such as the Engineer-in-Training (EIT) examination review classes, the Engineers' Week Exhibition, the annual St. Patrick's Day Dance, and the "Southern Engineer" student publication.

BIOLOGICAL AND AGRICULTURAL ENGINEERING

(Also see Agriculture and Life Sciences.)

David S. Weaver Laboratories (Room 100)

Professor R. S. Sowell, *Interim Head of the Department and Graduate Administrator*

Professor G. B. Blum, Jr., *Coordinator of Advising*

(For a list of faculty, see Agriculture and Life Sciences.)

Biological and agricultural engineering students are trained to deal with problems of agriculture that are engineering in nature. Scientific and engineering principles are applied to the conservation and utilization of water and soil, the development of power and labor-saving devices for all phases of agricultural production, the design of structures and equipment for housing and handling livestock and field products, and the processing and marketing of agricultural products.

OPPORTUNITIES

Graduates of the Engineering curriculum qualify for positions in design, development and research in public institutions and in industry. This curriculum, accredited by the Accreditation Board for Engineering and Technology, also provides adequate training for post-graduate work leading to advanced degrees. (See listing of graduate degrees offered).

CURRICULUM IN BIOLOGICAL AND AGRICULTURAL ENGINEERING

The engineering curriculum provides an educational program for students which uniquely prepares them for dealing with engineering problems in the biological and agricultural areas. Program emphasis is on the agricultural area while flexibility in the program allows the student to attain depth in special sub-areas or in biological engineering. Emphasis is placed on basic science and engineering courses such as mathematics, physics, mechanics, biology, soils, and thermodynamics which provide a sound background for the application of engineering to agricultural and biological problems.

Since biological and agricultural engineering involves two distinct technical fields—agriculture and engineering—the curriculum is jointly administered by The College of Agriculture and Life Sciences and the College of Engineering. Undergraduate freshmen entering this curriculum should enroll in the College of Engineering undesignated program and indicate SBU as their curriculum choice. After successfully completing the Engineering undesignated requirements the student will enter the Biological and Agricultural Engineering Department. Graduates receive a B.S. in Biological and Agricultural Engineering.

FRESHMAN YEAR

Fall Semester	*Credits*
CH 101 General Chemistry I	4
E 100 Introduction to COE	0
E 115 Intro. to Computing Envir.	1
ENG 111 Composition and Rhetoric	3
MA 141 Analytic Geometry & Calc. I	4
PE 100 Health & Physical Fitness	1
Humanities/Social Science Elective	3
	16

Spring Semester	*Credits*
CH 107 Chem. Principles & Appl.	4
ENG 112 Composition and Reading	3
MA 241 Analytic Geometry & Calc. II	4
PY 205 Physics for Engr. & Scient.	4
Physical Education Elective	1
	16

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BAE 151 Elements of BAE I	2	BAE 252 Elements of BAE II	4
BS 100 General Biology	4	MA 341 Applied Diff. Eqns. I	3
MA 242 Analytic Geometry & Calc. III	4	MAE 208 Engineering Dynamics	3
MAE 206 Engineering Statics	3	MAE 314 Solid Mechanics	3
PY 208 General Physics	4	SSC 200 Soil Science *or*	
Physical Education Elective	1	CH 220 Organic Chemistry	4
	18	Physical Education Elective	1
			18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BAE 471 Soil & Water Engineering	4	BAE 342 Agricultural Processing	4
GC 101 Engineering Graphics	2	BAE 361 Analytical Methods	3
MAE 301 Engr. Thermodynamics I	3	ECE 211 Electric Circuits I	3
MAE 308 Fluid Mechanics I	3	ECE 213 Electric Circuits Lab I	1
Humanities/Social Science Elective	3	ENG 331 Comm. for Engr. & Tech.,	3
Free Elective	3	History or Philosophy of Science	3
	18		17

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BAE 391 ElectroTechnology in BAE	3	BAE 452 Agri. Engineering Design II	2
BAE 451 Agri. Engineering Design I	4	BAE 462 Funct. Dsgn. Field Machines	3
BAE 481 Agri. Struct. & Environ.	4	Engineering Science Elective	3
Humanities/Social Science Elective	3	Advanced Humanities Elective	3
Free Elective	3	Advanced Social Science Elective	3
	17	Free Elective	3
			17

Minimum Hours Required for Graduation ... 137

NOTE: Students in the Engineering Program in Biological and Agricultural Engineering are officially enrolled in a curriculum jointly administered by the College of Agriculture and Life Sciences and the College of Engineering. Duplicate academic records are kept in both college offices. All graduates receive the accredited engineering degree, as BS in Biological and Agricultural Engineering. The humanities and social sciences electives listed above must be selected as outlined for the College of Engineering in the Undergraduate Catalog and as listed on the college's approved list. Before any engineering student is eligible to enroll in a 200 and higher level engineering course that is a required course in the student's engineering curricula, the student must have earned a "C" or better in Chemistry 101, English 111, Mathematics 141 and 241, and Physics 205. This requirement applies to all students enrolled in the jointly administered SBE curriculum. Accredited by Accreditation Board for Engineering and Technology, Inc. (ABET).

CHEMICAL ENGINEERING

Riddick Engineering Laboratories (Room 113)

Professor G. W. Roberts, *Head of the Department*

Associate Professor C. J. Setzer, *Associate Head of the Department*

Professor C. K. Hall, *Graduate Administrator*

Professor D. B. Marsland, *Coordinator of Advising*

Distinguished University Professor: D. F. Ollis

Alumni Distinguished Undergraduate Professor: R. M. Felder

Alcoa Professor: J. K. Ferrell

Camille Dreyfus Professor: H. B. Hopfenberg

Hoechst-Celanese Professors: R. G. Carbonell, R. M. Felder

Professors K. G. Bachmann, R. G. Carbonell, P. S. Fedkiw, R. M. Felder, J. K. Ferrell, C. K. Hall, H. B. Hopfenberg, D. C. Martin, D. F. Ollis, M. R. Overcash, G. W. Roberts, E. P. Stahel; *Adjunct Professors:* W. J. Koros, D. R. Squire, A. H. Weiss; *Professors Emeriti* K. O. Beatty, D. B. Marsland, A. S. Michaels, J. F. Seely, V. T. Stannett; *Associate Professors:* C. M. Balik, P. K. Kilpatrick, P. K. Lim, C. J. Setzer, S. Torquato, H. Winston; *Adjunct Associate Professors:* D. A. Denny, J. L. Williams; *Assistant Professors:* R. T. Chern, B. D. Freeman, C. S. Grant, H. H. Lamb, S. W. Peretti.

The sound management of material and energy resources, taking into account natural, economic, and environmental constraints, guides the performance of chemical engineering practice. Chemical engineering education integrates design and analysis, science and technology, with communication skills developed through exposure to the humanities and the social and economic sciences. Chemical engineering organizes these diverse skills into a coherent discipline uniquely suited to the needs of the chemical, biochemical, petroleum, plastics, textile, and pulp and paper industries.

FACILITIES

Departmental teaching and research activities are based on the four floors comprising the east wing of the Riddick Engineering Laboratories. Equipment for studying the principles of fluid flow, heat transfer, distillation, absorption, drying, crystallization, and filtration is maintained in several laboratories. Chemical reaction kinetics including the kinetics of radiation-induced polymerization reactions are studied on specially designed equipment. Extensive apparatus is available for characterizing the relationships between molecular structure and bulk properties of polymers.

A 2,000 square foot biotechnology laboratory has been equipped to include a pilot plant for studying biologically mediated chemical reactions. Specialized digital computational equipment complements campus-wide university computer resources. The department makes constant use of its fully expanded MicroVax-3600 computer system which is accessible for use 24 hours a day by students and faculty.

OPPORTUNITIES

Competition for chemical engineering graduates at all degree levels is intense. Graduates readily find employment at extremely attractive salaries in diverse subdisciplines including research and development, production, management and administration; process control, technical service, and sales; estimation and specification writing; consulting and teaching. Students desiring careers in teaching or consulting are advised to consider graduate training (see listing of graduate degree offered). Chemical engineering graduates often pursue careers in law or the medical sciences since the broadly structured undergraduate curriculum provides strong preparation for graduate study in a wide range of professional specialties.

CURRICULUM IN CHEMICAL ENGINEERING

The successful practice of chemical engineering requires a broad, diversified preparation. The spirit of research and experimental inquiry is vital; students, therefore, require sound scientific backgrounds essential to original and disciplined thought, enthusiastic inquiry and, ultimately, original and constructive accomplishment. The undergraduate curriculum emphasizes the scientific, engineering, and economic principles involved in the design and operation of chemical processes. The background in organic, physical, and inorganic chemistry is comparable to the training offered to chemistry majors. Mathematics, physical sciences, and distributed humanities courses are also required. The chemical engineering program, which is accredited by the Accreditation Board for Engineering and Technology (ABET), leads to the degree Bachelor of Science in Chemical Engineering.

FRESHMAN YEAR

Fall Semester	*Credits*
CH 101 General Chemistry I	4
E 100 Introduction to COE	0
E 115 Intro. to Computing Envir.	1
ENG 111 Composition and Rhetoric	3
MA 141 Analytic Geometry & Calc. I	4
PE 100 Health & Physical Fitness	1
Humanities/Social Science Elective	3
	16

Spring Semester	*Credits*
CH 107 Chem. Principles & Appl.	4
ENG 112 Composition and Reading	3
MA 241 Analytic Geometry & Calc. II	4
PY 205 Physics for Engr. & Scient. I	4
Physical Education Elective	1
	16

SOPHOMORE YEAR

Fall Semester	*Credits*
CH 221 Organic Chemistry I	4
CHE 205 Chemical Process Principles	4
CSC 112 Intro. to Computing—FORTRAN	3
MA 242 Analytic Geometry & Calculus III	4
Physical Education Elective	1
	16

Spring Semester	*Credits*
CH 223 Organic Chemistry II	4
CHE 225 Chemical Process Systems	3
PY 208 Physics for Engr. & Sci. II	4
MA 341 Appl. Differential Eq. I	3
Humanities/Social Science Elective[2]	3
Physical Education Elective	1
	18

JUNIOR YEAR

Fall Semester	*Credits*
CHE 311 Transport Processes I	3
CHE 315 Chemical Process Thermodynamics	3
ECE 331 Princ. of Electrical Engr. I	3
MAT 201 Struct. & Prop. of Engr. Mat'ls.	3
Humanities/Social Sciences Elective[2]	3
Free Elective	3
	18

Spring Semester	*Credits*
CH 437 Physical Chemistry for Engr.	4
CHE 312 Transport Processes II	3
CHE 316 Thermo. Chem. & Phase Eq.	3
CHE 330 Chemical Engr. Lab I	3
Humanities/Social Science Elective[2]	3
	16

SENIOR YEAR

Fall Semester	*Credits*
CHE 331 Chemical Engr. Lab II	3
CHE 446 Design & Anly. Chem. Reactors	3
CHE 450 Chemical Engineering Design I	3
CHE 495 Seminar in Chem. Engr.	1
Humanities/Social Science Elective[2]	3
Free Elective	3
	16

Spring Semester	*Credits*
CH 315 Quantitative Analysis	4
CHE 425 Proc. Syst. Anly. & Control	3
CHE 451 Chem. Engr. Design II	3
Humanities/Social Science Elective[2]	3
Free Elective	3
	16

Minimum Hours Required for Graduation 132

[1]CHE 497 Chemical Engr. Projects strongly recommended as one of the Technical Electives.
[2]Humanities and Social Sciences requirement courses must be selected from the approved College of Engineering list.

BIOSCIENCES OPTION IN CHEMICAL ENGINEERING

By enhanced exposure to the biological sciences, the biosciences option in chemical engineering enables the student to develop insight into biological systems and processes.

FRESHMAN YEAR

See the freshman year for the curriculum in chemical engineering. Students in the biosciences option should take EB 201 Economics I as the humanities/social science elective in the fall semester and CH 107 General Chemistry II (4 cr.) in the spring. Freshman year credits equal 32 hours.

SOPHOMORE YEAR

Fall Semester	*Credits*
CH 221 Organic Chemistry I	4
CHE 205 Chemical Proc. Principles	4
CSC 112 Intro. to Comp.—FORTRAN	3
MA 242 Anly. Geometry & Calc. III	4
Humanities/Social Sciences Elective[1]	3
	18

Spring Semester	*Credits*
CH 223 Organic Chemistry II	4
CHE 225 Chemical Proc. Systems	3
MA 341 Applied Differential Equations I	3
PY 208 Physics for Engr. & Sci. II	4
Humanities/Social Science Elective[1]	3
Physical Education Elective	1
	18

JUNIOR YEAR

Fall Semester	*Credits*
BS 100 General Biology	4
CHE 311 Transport Processes I	3
CHE 315 Chem. Proc. Thermodynamics	3
ECE 331 Prins. of Elect. Engr. I *or*	
MAT 201 Structure & Prop. Engr. Mat'ls	3
Physical Education Elective	1
Free Elective	3
	17

Spring Semester	*Credits*
BCH 451 Introductory Biochemistry	3
BCH 452 Introductory Biochemistry Lab	2
CHE 312 Transport Processes II	3
CHE 316 Thermo. Chemical & Phase Equilibria	3
CHE 330 Chemical Engineering Lab I	3
Humanities/Social Science Elective[1]	3
	17

SENIOR YEAR

Fall Semester	*Credits*
CH 437 Physical Chemistry for Engineers	4
CHE 331 Chemical Engr. Lab II	3
CHE 446 Design & Anly. of Chem. Reactors	3
CHE 450 Chem. Engr. Design I	3
CHE 495 Seminar in Chem. Engr.	1
Humanities/Social Science Elective[1]	3
	17

Spring Semester	*Credit*
CHE 425 Process System Analysis & Control	3
CHE 451 Chemical Engr Design	3
CHE 551 Biochemical Engineering	3
Humanities/Social Science Elective[1]	3
Free Electives	6
	18

Minimum Hours Required for Graduation ... 137

[1] Humanities and social science requirement courses must be selected from the approved College of Engineering list.

CIVIL ENGINEERING

Mann Hall (Room 203)

Professor E. Downey Brill, Jr., *Head of the Department*

Professor H. E. Wahls, *Associate Head for Graduate Programs*

Professor J. S. Fisher, *Associate Head*

Professor J. F. Ely, *Coordinator of Advising*

Distinguished University Professor: P. Z. Zia

Alumni Distinguished Undergraduate Professor: P. D. Cribbins

Harrelson Professor: P. H. McDonald

Professors: P. D. Cribbins, R. A. Douglas, W. S. Galler, A. K. Gupta, K. S. Havner, Y. Horie, D. W. Johnston, N. P. Khosla, P. B. McDonald, C. C. Tung, P. Zia; *Adjunct Professor:* R. C. Heath; *Professors Emeriti:* M. Amein, W. F. Babcock, R. E. Fadum, C. L. Heimbach, J. W. Horn, A. I. Kashef, C. L. Mann, Jr., S. W. Nunnally, C. Smallwood, Jr., M. E. Uyanik; *Associate Professors:* S. H. Ahmad, W. L. Bingham, R. H. Borden, A. C. Chao, E. D. Gurley, P. C. Lambe, H. R. Malcom, V. C. Matzen, J. M. Nau, M. F. Overton, M. S. Rahman, W. J. Rasdorf, J. C. Smith, J. R. Stone; *Associate Professor Emeritus:* G. R. Taylor; *Assistant Professors:* M. A. Barlaz, J. W. Baugh, Jr., R. C. Borden, F. Farid, Y. R. Kim, A. E. Schultz; *Adjunct Assistant Professors:* J. C. Brantley, III, L. R. Goode, B. E. Matthews, R. R. Rust; *Lecturers:* M. L. Leming, D. J. Lombardi; *Lecturer and Senior Construction Extension Specialist:* P. P. McCain; *Adjunct Lecturers:* R. F. DeBruhl, J. A. K. Tucker; *Senior Extension Specialist:* S. M. Rogers, Jr.

Civil engineering, one of the broadest of the engineering fields, traditionally concerns the improvement and control of the environment. A civil engineer may deal with the planning, design, construction, operation and maintenance of everything from buildings, bridges, dams, harbors, water and power facilities, sewage disposal works, and nuclear waste facilities to transportation systems like highways, railways, waterways, airports and pipe lines.

The Department of Civil Engineering offers curricula that provide academic preparation for students considering a career in civil engineering or construction. The sound general education of the undergraduate program prepares the student for advanced study either through graduate study or self-study.

The Civil Engineering Program, which is accredited by the Accreditation Board for Engineering and Technology (ABET), leads to the degree Bachelor of Science in Civil Engineering. The Civil Engineering-Construction Option Program, also accredited by ABET, leads to the degree of Bachelor of Science in Civil Engineering-Construction Option. The new Construction Management Program will be presented for accreditation to the American Council for Construction Education (ACCE), following graduation of the first class. This program leads to the degree of Bachelor of Science in Construction Management.

OPPORTUNITIES

Man will always need constructed facilities to live, work and sustain his life, and the civil engineer will always be needed to plan, design and construct these facilities. Civil engineering is such a diversified field that a civil engineering graduate has a wide choice in locations and types of employment. Jobs range from federal, state or municipal agencies to a variety of manufacturing and processing industries, consulting firms or construction companies. The work may be performed partially or wholly in an office or in the field and may be located in a small community, a large industry center or in a foreign country. Careers in teaching and research are common for many civil engineers who complete advanced degrees.

FACILITIES

Open access is available to the department's micro-computer laboratory providing support in analysis, design-synthesis and word processing. Laboratories for testing structural materials, large models or full-scale structures, for soils and bituminous products, for hydraulic experiments, for analysis of small structural models, for chemical and biological tests pertaining to sanitary engineering, and for the investigation of transportation problems all help students learn more about their field.

CURRICULA IN CIVIL ENGINEERING

Three four-year undergraduate curricula are offered; one leads to a Bachelor of Science in Civil Engineering; the second, to a Bachelor of Science in Civil Engineering-Construction Option; and the third, to a Bachelor of Science in Construction Management.

The civil engineering curriculum is a balanced program providing academic discipline in the pure and applied physical sciences, the humanities and social sciences, and the professional aspects of civil engineering including structural, transportation and water resources engineering, and soil mechanics and foundations.

The curriculum in the civil engineering-construction option is designed for students interested in the construction phases of civil engineering. It includes the core course requirements in the physical sciences and the social sciences and humanities. The curriculum includes a three-semester sequence of courses in cost analysis and control, and construction methods and planning. These courses provide academic discipline in the engineering, planning and management aspects of construction. Graduates of the construction option curriculum prepare to become construction engineers.

The bachelor of science in construction management is offered for students interested in entering the construction industry in management and administrative functions. Graduates of this curriculum are exposed to the broader construction management problems involving business and finance along with the necessary engineering training. This curriculum features an off-campus internship program during two summers, one between the sophomore and junior year and the second between the junior and senior year, with a construction firm. During the senior year, the student selects a construction concentration in either general construction, mechanical construction or electrical construction. Graduates usually become construction managers responsible for managing a number of construction projects.

CIVIL ENGINEERING CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*
CH 101 General Chemistry I	4
E 100 Introduction to COE	0
E 115 Intro. to Computing Envir.	1
ENG 111 Composition and Rhetoric	3
MA 141 Analytic Geometry & Calc. I	4
PE 100 Health & Physical Fitness	1
Humanities/Social Science Elective	3
	16

Spring Semester	*Credits*
CSC 110 Intro. to Comp.—Pascal	3
ENG 112 Composition and Reading	3
MA 241 Analytic Geometry & Calc. II	4
PY 205 Physics for Engr. & Scient.	4
Physical Education Elective	1
	15

SOPHOMORE YEAR

Fall Semester	*Credits*
CE 200 Civil Engr. Meas. & Surveys	3
CE 214 Engineering Mechanics—Statics	3
GC 101 Engineering Graphics I	2
MA 242 Analytic Geometry & Calc. III	4
PY 208 General Physics	4
Physical Education Elective	1
	17

Spring Semester	*Credits*
CE 215 Engr. Mech.—Dynamics	3
CE 313 Mechanics of Solids	3
MA 341 Appl. Differential Equations I	3
MAT 200 Mech. Prop. of Structural Mat'ls.	3
Humanities/Social Sciences Elective[1]	3
Physical Education Elective	1
	16

JUNIOR YEAR

Fall Semester	*Credits*
CE 324 Structural Behavior Measurement	1
CE 325 Structural Analysis	3
CE 332 Materials of Construction	3
CE 375 Civil Engineering Systems	3
CE 382 Hydraulics	3
CE 381 Hydraulics Lab	1
Humanities/Social Science Elective[1]	3
	17

Spring Semester	*Credits*
CE 305 Traffic Engineering	3
CE 327 Reinforced Concrete Design	3
CE 342 Engr. Behavior of Soils & Found.	4
CE 383 Hydrology & Urban Water Sys.	3
Basic Science Elective[2]	4
	17

SENIOR YEAR

Fall Semester	*Credits*
COM (SP) 110 Public Speaking	3
ECE 331 Princ. of Elect. Engr. I *or*	
MAE 301 Engineering Thermodynamics I	3
ENG 331 Communic. Engr. & Tech. *or*	
CE Design Elective I[3]	3
Engineering Science Elective[3]	3
Humanities/Social Science Elective[1]	3
Free Elective	3
	18

Spring Semester	*Credits*
CE Design Elective II[3]	3
Humanities/Social Science Electives[1]	6
Free Electives	6
	15

Minimum Hours Required for Graduation ... 131

[1]Humanities or social science courses to be selected from the appropriate list approved by the College of Engineering.
[2]Basic Science Elective (Select one): BS 100 General Biology (4); CH 107 Principles of Chemistry (4); or MEA 101 Geology I: Physical (3) and MEA 110 Geology I Laboratory (1).
[3]Approved Electives:

Design Electives

Pick two from list and include at least one course with asterisk

- *CE 400 Transportation Engr. Project
- CE 406 Transportation Systems Engr.
- CE 420 Structural Engr. Project
- *CE 426 Structural Steel Design
- CE 428 Structural Design in Wood
- *CE 440 Geotechnical Engr. Project (Foundations)
- CE 443 Seepage, Earth Embank. & Retain. Struct.
- CE 466 Building Construction in Engr.
- *CE 480 Water Resources Engr. Project
- CE 484 Water Supply & Waste Water Systems
- CE 502 Transportation Operations
- CE 503 Transportation Design
- CE 572 Design of Water & Wastewater Facilities
- CE 583 Engr. Aspects of Coastal Processes
- CE 585 Urban Stormwater Management

Engineering Science Electives

ECE 331 Principles of Electrical Engr. I
MAE 301 Engineering Thermodynamics I
MAT 400 Metallic Mat'ls in Engineering Design
CE 425 Intermediate Structural Analysis
CE 501 Transportation Engr. Analysis
CE 511 Continuum Mechanics I
CE 513 Theory of Elasticity I
CE 514 Stress Waves
CE 521 Advance Strength of Materials
CE 580 Flow in Open Channels
CE 584 Ground Water Hydraulics
MEA 461 Engineering Geology

CIVIL ENGINEERING—CONSTRUCTION OPTION CURRICULUM

FRESHMAN YEAR

See the freshman year for the curriculum in civil engineering. Students should select EB 201 Economics I as their humanities and social sciences elective.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CE 200 Civil Engineering Meas. & Surveys	3	CE 215 Engr. Mechanics—Dynamics	3
CE 214 Engineering Mechanics—Statics	3	CE 313 Mechanics of Solids	3
GC 101 Engineering Graphics I	2	MA 341 Appl. Differential Equations I	3
MA 242 Analytic Geometry & Calc. III	4	MAT 200 Mechanical Prop. of Struc. Mat'l	3
PY 208 General Physics	4	Humanities/Social Sciences Elective[1]	3
Physical Education Elective	1	Physical Education Elective	1
	17		16

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CE 325 Structural Analysis	3	CE 327 Reinforced Concrete Design	3
CE 332 Materials of Construction	3	CE 342 Engr. Behavior of Soils & Founda.	4
CE 375 Civil Engineering Systems	3	CE 365 Construction Equipment & Methods	3
CE 382 Hydraulics	3	CE 305 Traffic Engineering *or*	
CE 463 Constr. Estim. Planning & Control	3	CE 367 Mech. & Elect. Syst. in Building *or*	
Humanities/Social Science Elective[1]	3	CE 383 Hydrology & Urban Water Systems	3
	18	Basic Science Elective[2]	4
			17

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CE 426 Steel Design	3	ACC 280 Managerial Accounting *or*	
CE 464 Legal Aspects of Contracting	3	EB 326 Human Resource Management	3
CE 466 Building Construction Engr.	3	CE 469 Construction Engineering Proj.	3
ECE 331 Princ. of Electrical Engr. I *or*		Humanities/Social Science Electives[1]	6
MAE 301 Engineering Thermodynamics I	3	Free Electives	6
Humanities/Social Science Elective[1]	3		18
Free Elective	3		
	18	Minimum Hours Required for Graduation	135

[1]Humanities or Social Sciences courses to be selected from the appropriate list approved by the College of Engineering.
[2]Basic Science elective (Select one): BS 100 General Biology (4); CH 107 Principles of Chemistry (4); or MEA 101 Geology I: Physical (3) and MEA 110 Geology I Laboratory (1).

CIVIL ENGINEERING—CONSTRUCTION MANAGEMENT CURRICULUM

FRESHMAN YEAR

See the freshmen year for the civil engineering curriculum. Students in Construction Management should take EB 201 Economics I as the humanities and social sciences elective in the fall.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CE 200 Civil Engr. Meas. & Surveys	3	CE 215 Engineering Mechanics—Dynamics	3
CE 214 Engineering Mechanics—Statics	3	CE 313 Mechanics of Solids	3
GC 101 Engineering Graphics	2	EB 301 Intermediate Microeconomics	3
MA 242 Analytic Geometry & Calc. III	4	MA 341 Applied Differential Equations I	3
PY 208 Physics for Scientists & Engineers II	4	MAT 200 Mech. Prop. of Structural Mat'ls	3
Physical Education Elective	1	Physical Education Elective	1
	17		16

SUMMER INTERNSHIP: OFF-CAMPUS[3]

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ACC 280 Managerial Accounting	3	CE 367 Mech. & Elect. Syst. in Blds.	3
CE 322 Materials of Construction	3	COM(SP) 146 Business & Prof., Communications	3
CE 463 Const. Estim., Planning & Ctrl.	3	EB 302 Intermediate Macroeconomics	3
Construction Concentration Elective[1]	3	EB 320 Financial Management	3
Construction Concentration Elective[1]	3	Construction Concentration Elective[1]	3
Construction Concentration Lab Elective[1]	1	Construction Concentration Elective[1]	3
	16		18

SUMMER INTERNSHIP: OFF-CAMPUS[3]

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CE 464 Legal Aspects of Contracting	3	CE 469 Construction Engr. Project	3
EB 313 Marketing Methods *or*		Advanced Humanities Elective[2]	3
EB 325 Managerial Economics	3	Construction Concentration Elective[1]	3
EB 326 Human Resource Management	3	History Philosophy of Science Elective[2]	3
Intro. Humanities Elective[2]	3	Free Electives	6
Construction Concentration Elective[1]	3		18
Free Elective	3	Minimum Hours Required for Graduation	134
	18		

[1]CONSTRUCTION CONCENTRATION ELECTIVES (Select one group)

General Construction		*Electrical Construction*		*Mechanical Construction*	
CE 325	3	ECE 331	3	CE 324	1
CE 327	3	ECE 339	1	ECE 331	3
CE 342	4	ECE 305	3	MAE 301	3
CE 426	3	*and 4 of the following*		MAE 302	3
CE 465	3	ECE 332	3	MAE 316	3
CE 466	3	ECE 451	3	MAE 403	3
		ECE 452	3	*and one of the following*	
		ECE 453	3	MAE 310	3
		ECE 454	3	MAE 404	3

[2]Humanities courses to be selected from the appropriate list approved by the College of Engineering. Social Science requirements are fulfilled by EB 201, EB 301 and EB 302.

[3]In addition to the course work, the graduation requirement also includes a minimum of ten weeks of summer cooperative internship in the sophomore and junior years. The internships are spent off campus within the construction industry. Prior approval of internship activities must be obtained from the program director.

POST-BACCALAUREATE STUDY IN CIVIL ENGINEERING

If a student is interested in more intense specialization in a particular area of civil engineering, advanced level training is available leading to the Professional Degree in Civil Engineering, the Master of Science in Civil Engineering, the Master of Civil Engineering, or the Doctor of Philosophy. Specialization areas include coastal and ocean engineering, construction engineering and management, construction materials, environmental and water resources engineering, geotechnical engineering, mechanics and structural engineering and transportation engineering. With judicial choice of electives, a student may also prepare for additional study in law, business administration, business management and city and regional planning. The Department of Economics and Business offers a Master of Science in Management with several technical options including Civil Engineering—Construction.

COMPUTER SCIENCE

Withers Hall (Room 226 and 208)

Professor R. E. Funderlic, *Head of the Department*

Associate Professor T. L. Honeycutt, *Associate Head of the Department*

Lecturer J. Hatch, *Assistant Head of the Department, Coordinator of Advising*

Distinguished University Research Professor: D. L. Bitzer

Alumni Distinguished Undergraduate Professor: A. L. Tharp

Professors: W. Chou, R. E. Funderlic, D. C. Martin, D. F. McAllister, H. G. Perros, R. J. Plemmons, W. J. Stewart, K. C. Tai, A. L. Tharp; *Associate Professors:* J. A. Bowen, E. W. Davis, Jr., R. J. Fornaro, E. F. Gehringer, T. L. Honeycutt, H. D. Levin, W. E. Robbins, R. D. Rodman, C. D. Savage, M. F. Stallmann; *Adjunct Associate Professor:* V. Ahuja; *Assistant Professors:* D. R. Bahler, W. R. Cleaveland, III, R. A. Dwyer, P. J. Lanzkron, A. Ola, D. S. Reeves, M. A. Vouk; *Adjunct Assistant Professors:* N. M. Bengtson, K. D. Clark; *Lecturers:* S. J. Curtis, G. N. Fostel, J. Hatch, J. E. Perry; *Adjunct Lecturers:* E. W. Galloway, D. A. Lasher, W. D. Ruchte, D. A. Schur, E. R. Secrest, W. W. Turyn, Jr., R. W. Weeks, S. G. Worth, III; *Laboratory Supervisor:* W. G. Scott, Jr.; *Instructor:* K. S. Bryant; *Research Assistants:* K. P. Garrard, L. W. Taylor; *Associate Members of the Department:* J. W. Baugh, Jr. (Civil Engineering), C. D. Meyer, Jr. (Mathematics), W. J. Rasdorf (Civil Engineering).

The discipline of computer science has developed during the past three decades as a direct consequence of rapid growth of computers. This unprecedented technical revolution has made computers a part of life. Almost all areas of industry, the military establishment, government agencies, education and business use computers, and new applications continue to arise. Computers are used to help make and operate our automobiles, airplanes and spaceships; to help design our highways, bridges and buildings; to handle banking transactions and to assist in management decisions; to analyze farm production; as a research tool for the scientist; to monitor manufacturing processes, utilities and communication; and to provide a multitude of other services.

OPPORTUNITIES

A wide range of jobs exist for computer scientists since computers have diverse applications. There is a need for basic research into the principles of computer system design and the analysis of computational algorithms, and students may choose to continue their training with graduate study.

CURRICULUM IN COMPUTER SCIENCE

This undergraduate curriculum leads to a degree of Bachelor of Science in Computer Science. This program is accredited by the Computer Science Accreditation Commission of the Computer Science Accreditation Board. Core courses provide foundations in programming and computer languages, the structure of data, computer architecture, numerical analysis, and the theory of computation and programming languages. The restricted electives chosen in consultation with one's adviser during the junior year allow exploration of specific computer science areas or fields such as management information systems, database management systems, simulation, graphics, and software engineering.

Students in other departments may select courses in computer science as electives to broaden their programs of study and to learn how to use the computer for solving problems.

Before a computer science major is eligible to enroll in any 200 or 300 level required course in computer science the student must have a 2.00 or higher grade point average.

FRESHMAN YEAR

Fall Semester	*Credits*
CH 101 General Chemistry I	4
E 100 Introduction to COE	0
E 115 Intro. to Computing Envir.	1
ENG 111 Composition and Rhetoric	3
MA 141 Analytic Geometry & Calc. I	4
PE 100 Health & Physical Fitness	1
Humanities/Social Science Elective	3
	16

Spring Semester	*Credits*
CSC 110 Intro. to Comp.—Pascal	3
ENG 112 Composition and Reading	3
MA 241 Analytic Geometry & Calc. II	4
PY 205 Physics for Engr. & Scient. I	4
Physical Education Elective	1
	15

SOPHOMORE YEAR

Fall Semester	*Credits*
CSC 210 Programming Lang. Concepts	3
CSC 222 Discrete Math. Structures	3
EB 201 Economics	3
MA 242 Analytic Geometry & Calc. III	4
PY 208 General Physics II	4
Physical Education Elective	1
	18

Spring Semester	*Credits*
CSC 201 Basic Comp. Org. & Assm. Lang.	3
CSC 311 Data Structures	3
MA 305 Intro. Linear Alg. & Mat.	3
Basic Science	3
Humanities/Social Science Elective[1]	3
Physical Education Elective	1
	16

JUNIOR YEAR

Fall Semester	*Credits*
CSC 202 Operating Systems	3
CSC 302 Numerical Methods	3
ST 371 Intro. to Prob. & Dist. Theo.	3
CSC Restricted Elective[2]	3
Humanities/Social Science Elective[1]	3
Free Elective	3
	18

Spring Semester	*Credits*
CSC 310 Software Engineering	3
CSC 312 Comp. Organization & Logic	4
ENG 331 Communication of Tech. Info.	3
CSC Restricted Elective[2]	3
CSC Theory Course[3]	3
	16

SENIOR YEAR

Fall Semester	*Credits*
CSC Project Course	3
CSC Restricted Elective[2]	3
Humanities/Social Science Elective[1]	3
Restricted Elective[2]	3
Free Elective	3
	15

Spring Semester	*Credits*
CSC Restricted Elective[2]	3
Humanities/Social Science Elective[1]	3
Restricted Electives[2]	6
Free Elective	3
	15

Minimum Hours Required for Graduation .....129[4]

[1]To be taken according to the requirements of the College of Engineering.
[2]Contact coordinator of advising for list of approved courses.
[3]A single course offered for the first time in the academic year 1991-1992 will be the only course that satisfies the theory course requirement for students who enter the CSC program after May 1990.
[4]The GPA earned in all courses attempted at NCSU must be 2.0 or higher to satisfy University graduation requirements. In addition, the College of Engineering requires either a GPA of 2.0 or higher in all courses bearing the CSC designation, or a grade of C or higher in each CSC course used to satisfy the requirement of the major.

MINOR IN COMPUTER PROGRAMMING

The Department of Computer Science offers a minor in computer programming to majors in any field except computer science and computer engineering. The minor consists of the completion with a grade of C or higher of CSC 101 or 110, 102 or 210, 201, 202, 311, a second programming language (COBOL, FORTRAN, 370 Assembler, SNOBOL, C,Ada), and MA 121 (or any calculus course). At least four of these seven courses must be taken at NCSU.

ELECTRICAL AND COMPUTER ENGINEERING

Daniels Hall (Room 232)

Professor R. K. Cavin, III, *Head of the Department*

Associate Professor W. T. Easter, *Associate Head of the Department*

Visiting Assistant Professor G. E. Edgington, *Graduate Coordinator*

Lecturer J. H. Larson, *Coordinator of Advising*

University Professor: D. R. Rhodes

Alumni Distinguished Undergraduate Professor: M. A. Littlejohn

Alumni Distinguished Graduate Professor: J. B. O'Neal, Jr.

Professors: D. P. Agrawal, W. E. Alexander, B. J. Baliga, S. M. Bedair, W. Chou, T. H. Glisson, J. J. Grainger, J. R. Hauser, J. F. Kauffman, R. M. Kalbas, M. A. Littlejohn, N. A. Masnari, N. F. J. Matthews, L. K. Monteith, H. T. Nagle, Jr., A. A. Nilsson, J. B. O'Neal, Jr., C. M. Osburn, A. Reisman, D. R. Rhodes, R. J. Trew, H. J. Trussell, A. VanderLugt, J. J. Wortman; *Adjunct Professors:* E. Brglez, E. Christian, W. A. Flood, J. W. Gault, W. L. Glomb, W. C. Holton, G. J. Iafrate, M. A. Stroscio, R. Tsu; *Professors Emeriti:* W. J. Barclay, A. R. Eckles, A. J. Goetze, G. B. Hoadley, F. J. Tischer; *Associate Professors:* S. T. Alexander, G. F. Bland, D. F. Gehringer, W. T. Liu, R. C. Luo, T. K. Miller, III, J. J. Paulos, S. A. Rajala, W. E. Snyder, M. W. White; *Adjunct Associate Professors:* J. J. Brickley, Jr., J. R. Burke, T. K. Burke, J. A. Hutchby, J. R. Jones, S. H. Lee, H. L. Martin, J. W. Mink; *Associate Professors Emeriti:* N. R. Bell, E. G. Manning, W. C. Peterson, W. P. Seagraves, E. W. Winkler; *Assistant Professors:* S. Ardalan, R. S. Colby, R. S. Gyurcsik, A. W. Kelly, D. S. Reeves, G. A. Ruggles, M. B. Steer, J. K. Townsend, D. E. Van den Bout; *Adjunct Assistant Professors:* D. L. Dreifus, J. H. Hong, D. W. Hislop, T. H. Hubing, M. Lorenzetti, P. Santago, C. K. Williams; *Assistant Professor Emeritus:* L. R. Herman; *Lecturers:* C. C. Cockrell, R. T. Kuehn, J. H. Shelly; *Adjunct Lecturers:* C. E. Branscomb, J. C. Greeson, P. T. Hutchinson, J. W. Watterson; *Research Associates:* G. L. Bilbro, J. Ramdani; *Research Assistants:* E. S. Condon, J. M. O'Sullivan; *Associate Members of the Department:* S. Khorram (Forestry), G. Lucovsky (Physics), J. Narayan (Materials Science and Engineering), J. F. Schetzina (Physics).

The professions of electrical engineering and computer engineering are concerned with the design, construction and testing of systems based on electrical phenomena. In contemporary technological society, electrical methods are used to communicate and store information, control equipment and systems, perform mathematical operations, and convert energy from one form to another. Frequently, two or more of these functions are important in the design of systems such as radio, television, telecommunications, computers, industrial robots, telemetry, electric machinery, and systems for generation and transmission of electric power.

Computer engineering is a field in which digital techniques are used in system design. Low-cost solid state microprocessors and memories permit computers to be widely incorporated in many different types of electronic systems. To work effectively in this rapidly growing field, the computer engineer must understand both hardware and software techniques and must effectively use both techniques in order to design, build and test optimum systems.

Both the Electrical Engineering and the Computer Engineering Programs, which lead to the degrees, Bachelor of Science in Electrical Engineering and Bachelor of Science in Computer Engineering, respectively, are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

SCHOLARSHIPS AND AWARDS

Superior academic performance is recognized within this department in three ways: election of students to membership in the electrical engineering honor society, Eta Kappa Nu; awarding of merit scholarships; and presentation of awards to outstanding seniors. The department has seven endowed merit scholarships which are usually awarded to juniors or seniors: Elizabeth P. Cockrell, L. A. Mahler, Amelia N. Mitta, Frank T. Pankotay, E. Chester Seewald, North Carolina Electric Membership Corporation, and William D. Stevenson, Jr., the latter two of which are for students studying electric power systems. In

addition, the William M. Cates Scholarship Program provides multiple scholarships for students having documented financial need and high academic performance. These are awarded to juniors, with provision for continuation in the senior year. The department also from time to time has scholarships provided by industrial organizations such as Mitsubishi Semiconductor, National Machine Tool Builders Association, and United Technologies. Merit is generally the primary requirement for these awards, but other characteristics, such as leadership, may also be specified.

FACILITIES

Many courses are accompanied by coordinated work in laboratory. Up-to-date facilities are provided for experimental study of electric and electronic circuits, digital systems, microprocessors, computers, electric machinery, VLSI design and fabrication, robotics, communication systems, and microwave systems. A new undergraduate computing laboratory features 30 microVAX workstations and 10 IBM personal computers with a VAX 3600 file server connected to the campus Ethernet. Substantial expansion of these facilities is planned for fall 1990.

CORE COURSES

The electrical and computer engineering curricula share core courses comprising a substantial portion of the first three years of study. Strong emphasis is placed on fundamental concepts in core courses so that graduates are prepared for rapid technological changes common in the electrical and computer engineering professions. A comprehensive foundation in mathematics and the physical sciences in the freshman year is followed in subsequent years with additional core courses in mathematics, physics, electric circuit theory, digital logic, computer systems, electronics, linear systems, and mechanics. Laboratory work is designed to demonstrate fundamental principles and to provide experience in designing and testing electronic hardware and computer software. Both curricula have required senior design courses which give students comprehensive experience in designing, building and testing physical systems.

ELECTRICAL ENGINEERING CURRICULUM

In addition to the core courses described above, students in the electrical engineering curriculum take courses in electromagnetic fields, solid-state devices, and electric power systems in their junior year and thermodynamics in their senior year. Students may choose a broad or concentrated path of study in the senior year by taking three senior courses of their choice. More than 20 elective courses are offered in communications, microelectronics, digital systems, robotics, electromagnetics, and electric power systems.

FRESHMAN YEAR

Fall Semester	*Credits*
CH 101 General Chemistry I	4
E 100 Introduction to COE	0
E 115 Intro. to Computing Envir.	1
ENG 111 Composition and Rhetoric	3
MA 141 Analytic Geometry & Calc. I	4
PE 100 Health & Physical Fitness	1
Humanities/Social Science Elective	3
	16

Spring Semester	*Credits*
CSC 110 Intro. to Comp.—Pascal	3
ENG 112 Composition and Reading	3
MA 241 Analytic Geometry & Calc. II	4
PY 205 Physics for Engr. & Scient. I	4
Physical Education Elective	1
	15

SOPHOMORE YEAR

Fall Semester	*Credits*
COM (SP) 110 Public Speaking	3
ECE 211 Electric Circuits I[1]	3
ECE 213 Electric Circuits I Lab.	1
MA 242 Analytic Geometry & Calc. III	4
PY 208 Physics Engrs. & Scien. II	4
Physical Education Elective	1
	16

Spring Semester	*Credits*
CE 213 Introduction to Mechanics	3
ECE 212 Fund. of Logic Design[1]	3
ECE 214 Fund. of Logic Design Lab	1
ECE 221 Electric Circuits II[1]	3
ECE 223 Electric Circuits II Lab	1
MA 341 Differential Equations	3
Humanities/Social Science Elective[2]	3
Physical Education Elective	1
	18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
COM (SP) 301 Presentational Speaking	3	ECE 218 Comp. Org. & Microproc.[1]	3
ECE 301 Linear Systems	3	ECE 305 Electric Power Systems	3
ECE 303 Electromagnetic Fields	3	ECE 341 Solid State Devices	3
ECE 314 Electronic Circuits	3	ENG 331 Communication Engr. & Tech.	3
MA 314 Probability, Appl. to ECE	3	Humanities/Social Science Elective[2]	3
Humanities/Social Science Elective[2]	3	Free Elective	3
	18		18

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 301 Engr. Thermodynamics	3	ECE 480 EE Senior Design Project	4
Approved Department Elective[3]	3	Humanities/Social Science Elective[2]	3
Humanities/Social Science Elective[2]	3	Senior Design Elective[3]	3
Numerical Methods Elective[3]	3	Free Electives	6
Senior Design Elective[3]	3		16
	15		

Minimum Hours Required for Graduation ...132[4]

[1]Must be completed with a grade of C or higher.
[2]To be taken according to requirements of the College of Engineering.
[3]Contact coordinator of advising for list of approved courses.
[4]The GPA earned in all courses attempted at NCSU must be 2.0 or higher to satisfy University graduation requirements. In addition, the college required either (1) a GPA of 2.0 or higher in all courses bearing the ECE designation of (2) a grade of C or higher in each ECE course used to satisfy requirements in the major. Graduation requirements also include attendance at two professional technical society meetings during the junior and senior years. The student is responsible for providing documentation showing satisfaction of this requirement.

COMPUTER ENGINEERING CURRICULUM

In addition to the core courses described above, students in the computer engineering curriculum take courses in discrete mathematics, design of complex digital systems, advanced programming, operating systems, and data structures in their sophomore and junior years. Students may choose a broad or concentrated path of study in their senior year by taking three senior courses of their choice. A variety of elective courses are offered in communications, microelectronics, digital systems, controls, and VLSI design. In addition, several senior-level courses in computer science are approved as elective courses for computer engineering.

FRESHMAN YEAR

See the freshman year for the electrical engineering curriculum. Freshman year credits equal 31 hours.

SOPHOMORE YEAR

Fall Semester	*Credit*	*Spring Semester*	*Credits*
COM (SP) 110 Public Speaking	3	CSC 222 Discrete Math. Structures	3
CSC 210 Programming Language Concepts	3	ECE 211 Electric Circuits I[1]	3
ECE 212 Fund. of Logic Design[1]	3	ECE 213 Electric Circuits Lab.	1
ECE 214 Fund. Logic Design Lab.	1	ECE 218 Comp. Org. & Microproc.[1,3]	3
MA 242 Analy. Geom. & Calc. III	4	MA 341 Differential Equations	3
Humanities/Social Science Elective[2]	3	PY 208 Physics Engrs. & Scien. II	4
Physical Education Elective	1	Physical Education Elective	1
	18		18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ECE 221 Electric Circuits II[1]	3	CSC 202 Concepts, Facil. Op. Syst.[3]	3
ECE 223 Electric Circuits II Lab.	1	CSC 311 Data Structures	3
ECE 342 Dsgn. Complex Digital Syst.	3	ECE 301 Linear Systems	3
MA 314 Probability, Applic. to ECE	3	ECE 314 Electronic Circuits	3
Humanities/Social Science Elective[2]	3	ENG 331 Communic. Engr. & Tech.	3
Free Elective	3	Humanities/Social Science Elective[2]	3
	16		18

SENIOR YEAR

Fall Semester	*Credits*
CE 213 Intro. to Mechanics	3
CPE Senior Elective[4]	3
Humanities, Social Science Elective[2]	3
Senior Design Elective[4]	3
Free Elective	3
	15

Spring Semester	*Credits*
ECE 481 CPE Senior Design Project	4
CPE Senior Elective[4]	3
Humanities, Social Science Elective[2]	3
Numerical Methods Elective[4]	3
Free Elective	3
	16

Minimum Hours Required for Graduation ...132[5]

[1]Must be completed with a grade of C or higher.
[2]To be taken according to the requirements of the Engineering College.
[3]ECE 218 serves as prerequisite to CSC 202 in lieu of CSC 201.
[4]Contact coordinator of advising for list of approved courses.
[5]The College requires either (1) a GPA of 2.0 or higher on all courses bearing the ECE designation or (2) a grade of C or higher in each ECE course used to satisfy requirements in the major. CSC courses used for CPE Senior Electives must satisfy the same grade requirements as ECE courses in (1) and (2) above. Graduation requirements also include attendance at two professional technical society meetings during the junior and senior years. The student is responsible for providing documentation showing satisfaction of this requirement.

ENGINEERING

Page Hall (Room 120)

The B. S. in Engineering degree offers an individualized academic program for those exceptional students who have academic and career goals that can not be accommodated by the other engineering degree programs. Before being admitted into the program, students must complete the freshmen year, have at least a 2.5 grade point average, have completed the course requirement for admission into an engineering degree program and have a plan of study approved by the student's advisory committee and the dean. For information about the program, contact the Assistant Dean for Academic Affairs.

INDUSTRIAL ENGINEERING

Riddick Engineering Laboratories (Room 328)

Professor S. D. Roberts, *Head*

Lecturer C. L. Smith, *Assistant Department Head*

University Professor: S. E. Elmaghraby

Alumni Distinguished Undergraduate Professor: C. L. Smith

James T. Ryan Professor: A. L. Prak

Professors M. A. Ayoub, R. H. Bernhard, J. R. Canada, S. E. Elmaghraby, S. C. Frang, T. J. Hodgson, H. L. W. Nuttle, P. J. O'Grady, R. G. Pearson, A. L. Prak, W. A. Smith, Jr.; *Professors Emeriti:* R. E. Alvarez, C. A. Anderson, J. J. Harder, R. W. Llewellyn; *Associate Professors:* C. T. Culbreth, Y. Fathi, E. T. Sanii, R. E. Young; *Assistant Professors:* D. W. Aldrich, J. F. Antin, D. P. Bischak, R. E. King, R. O. Mittal, J. Trevino; *Lecturers:* J. A. Ekwall, W. G. Morrissey, L. M. Struble.

INDUSTRIAL ENGINEERING CURRICULUM

The industrial engineer designs, improves, and installs integrated systems of people, materials, equipment, and information, drawing upon specialized knowledge and skill in the mathematical, physical and social sciences, together with the principles and methods of engineering analysis and design to specify, predict and evaluate the results to be obtained

from these systems. Productivity and effective utilization of resources, including energy conservation, are principle concerns of practitioners. The industrial engineer may develop operations or improvements for many diverse activities, such as a hospital, a department store, a manufacturing enterprise, an insurance office or government function. His or her position in an organization is usually as a management advisor in contact with every phase of the organization.

The curriculum blends a basic group of common engineering technical courses with specialized courses in the major areas of industrial engineering—design of human and machine systems, design of management control systems, and improvement of manufacturing operations. The course offerings stress mathematical and statistical techniques of industrial systems analysis; quantitative methodologies of operations research; computers as a tool for problem solving and simulation; economic considerations of alternatives; control of product or service quality and quantity; specifications of the manufacturing process including the equipment and tooling; and the utilization of safety and human factors engineering principles.

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CSC 110 Intro. to Comp.—FORTRAN	3
E 100 Introduction to COE	0	ENG 112 Composition and Reading	3
E 115 Intro. to Computing Envir.	1	MA 241 Analytic Geometry & Calc. II	4
ENG 111 Composition and Rhetoric	3	PY 205 Physics for Engr. & Scient. I	4
MA 141 Analytic Geometry & Calc. I	4	Physical Education Elective	1
PE 100 Health & Physical Fitness	1		15
Humanities/Social Science Elective	3		
	16		

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
IE 100 Intro. to Industrial Engr.	1	ECE 331 Princ. of Electrical Engr.	3
MA 242 Analytic Geometry & Calc. III	4	GC 101 Engineering Graphics	2
MAT 201 Struct. & Prop.—Engr. Mat'l.	3	IE 307 Process Control Comp.	3
PY 208 General Physics	4	IE 311 Engr. Economics Analysis	3
Humanities/Social Science Elective[2]	3	MA 341 Applied Differential Equ. I	3
Physical Education Elective	1	ST 371 Intro. Prob. & Dist. Theory	3
	16	Physical Education Elective	1
			18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENG 331 Commun. Tech. Information	3	IE 352 Work Analysis & Design	3
IE 351 Manufacturing Engineering	3	IE 401 Stochastic Models in IE	3
IE 361 Determination Models in IE	3	IE 443 Quality Control	3
MAE 206 Engineering Statics	3	IE 452 Ergonomics	3
ST 372 Intro. Stat. Infer. & Regr.	3	Humanities/Social Science Elective[2]	3
Humanities/Social Science Elective[2]	3	Free Elective	3
	18		18

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ACC 280 Managerial Accounting	3	IE 498 Senior Project/Design Course	3
IE 308 Control Prod. & Serv. System	3	Engineering Science Electives[3]	6
IE 441 Intro. to Simulation	3	Humanities/Social Science Elective[2]	3
IE 453 Facilities Design	3	Free Elective	3
Humanities/Social Science Elective[2]	3		15
Free Elective	3		
	18	Minimum Hours Required for Graduation	...134[4]

[1]Must be completed with grade of C or better.
[2]To be taken according to COE requirements.
[3]Students select from approved departmental list (MAE 208, MAE 301, MAE 302, MAE 308, MAE 314, ECE 332).
[4]Graduation requirements include: (a) 2.0 overall GPA, or higher, in all courses attempted at NCSU and (b) 2.0 GPA in all IE designated courses or a C or better in all IE designated courses.

MINOR IN INDUSTRIAL ENGINEERING

To obtain a minor in industrial engineering a student must complete a minimum of fifteen hours from courses given on the departmental list. Students wishing to complete the minor requirements must make application to the Department of Industrial Engineering and must meet the same academic criteria used for transfer applications.

FURNITURE MANUFACTURING AND MANAGEMENT

Riddick Engineering Laboratories (Room 343)

Lecturer W. G. Morrissey, *Program Director*

Associate Professor: C. T. Culbreth; *Assistant Professor:* D. W. Aldrich.

The Furniture Manufacturing and Management program at NCSU is the only one of its kind in the United States. The furniture industry is concentrated in the Southeast with over 50 percent of the national output of wooden household furniture being produced within a 200 mile radius of High Point, North Carolina. The industry is in a period of rapid change due to the introduction of sophisticated computer-based manufacturing methods and control systems.

Attracting students on an international basis, the FMM program offers a manufacturing engineering education focusing on the materials, products, and processes of the furniture industry. The need for professionals having an engineering education will increase as the industry continues to automate its operations. Graduates will find challenging careers as engineers and managers in this important industry.

The faculty has industrial experience and maintains close contact with the furniture industry through involvement with the American Furniture Manufacturers Association and by conducting applied research and extension activities. The industry assists students by providing jobs in the cooperative education program and by making scholarship aid available through the Furniture Foundation, Inc. In addition, there are a number of private scholarships funded by generous individuals to commemorate prominent furniture executives.

CURRICULUM IN FURNITURE MANUFACTURING AND MANAGEMENT

The Bachelor of Science degree in furniture manufacturing and management prepares graduates for engineering and managerial positions in the furniture industry.

The curriculum stresses the application of engineering principles and computer-based controls to furniture manufacturing. Students have the opportunity to work with Computer Aided Design (CAD) systems and computer numerically controlled (CNC) machines. Related subjects, such as management, accounting, and economic analysis, address the business aspects of modern furniture production.

In addition to academic course work, a minimum of six weeks of continuous, gainful employment in a furniture manufacturing plant is required. Usually, such employment occurs between the junior and senior years.

FRESHMAN YEAR

See the freshman year for the industrial engineering curriculum. Furniture manufacturing and management students should take EB 201 Economics I as the fall humanities/social science elective and CSC 112 Intro. to Computing—FORTRAN in the spring. Freshman year credits equal 31 hours.

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
COM (SP) 110 Public Speaking	3	ECE 331 Princ. of Elect. Engr.	3
GC 101 Engineering Graphics	2	IE 241 Furniture Manufac. Proc. I	3
IE 100F Intro. to IE (FMM)	3	IE 307 Proc. Control Computing	3
IE 240 Furniture Product Engr.	1	ST 361 Intro. to Stat. for Engr.	3
PY 208 General Physics	4	WPS 202 Wood Struct. & Prop. I	3
Humanities Elective (Introductory)	3	Physical Education Elective	1
Physical Education Elective	1		16
	17		

SUMMER

WPS 205 Wood Products Practicum 5

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ACC 280 Managerial Accounting	3	IE 311 Engr. Economic Analysis	3
ENG 331 Commun. for Tech. Info.	3	IE 341 Furniture Plant Layout	3
IE 340 Furn. Mfg. Proc. II	4	History/Philosophy of Science	3
IE 345 Princ. of Upholstery	2	Social Science Elective (Introductory)	3
IE 352 Work Analysis & Design	3	Free Elective	3
Humanities Elective (Advanced)	3		15
	18		

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
EB 326 Human Resource Management	3	IE 440 Furn. Mgm't. Analysis	3
IE 371 Furn. Prod. Control	3	IE 472 Quant. Meth.—Furn. Mfg.	4
IE 443 Quality Control	3	Social Science Elective (Advanced)	3
Technical Elective	3	Technical Elective	2
Free Elective	3	Free Elective	3
	15		15

Minimum Hours Required for Graduation ...132[1]

[1]Also required for graduation: Six weeks of industrial employment.

MATERIALS SCIENCE AND ENGINEERING

Riddick Engineering Laboratories (Room 229)

Professor J. J. Hren, *Head of the Department*

Professor C. C. Koch, *Associate Department Head*

Professor A. A. Fahmy, *Graduate Administrator*

Lecturer R. L. Porter, *Undergraduate Coordinator*

Kobe Steel Distinguished University Professor: R. F. Davis

Alumni Distinguished Undergraduate Professor: R. L. Porter

Professors: K. J. Bachmann, J. R. Beeler, Jr., R. B. Benson, Jr., H. Conrad, R. F. Davis, A. A. Fahmy, J. J. Hren, C. C. Koch, K. L. Moazed, K. L. Murty, J. Narayan, H. Palmour III, G. A. Razgonyi, R. O. Scattergood, H. H. Stadelmaier; *Research Professor:* F. Shimura; *Visiting Professors:* D. Maher, D. M. Preiss; *Adjunct Professors:* B. R. Appleton, Y. Chen, C. R. Manning, Jr., G. Mayer, G. McGurie, J. Prater, J. Routbort; *Professors Emeriti:* W. W. Austin, J. K. Magor, R. F. Stoops; *Associate Professors:* C. M. Balik, N. El-Masry, A. I. Kingon, P. E. Russell; *Research Associate Professor:* J. Kasichainula; *Visiting Associate Professor:* J. C. Russ; *Adjunct Associate Professors:* O. H. Auciello, I. Turlik; *Associate Professor Emeritus:* J. Hamme; *Assistant Professor:* J. T. Glass; *Adjunct Assistant Professor:* J. Posthill; *Lecturers:* R. L. Porter, H.

A. West; *Research Associates:* D. P. Griffis, T. M. Hare, Z. Radzimski; *Associate Members of the Faculty:* J. A. Bailey (Mechanical and Aerospace Engineering), K. S. Havner (Civil Engineering), Y. Horie (Civil Engineering), G. Lucovsky (Physics), R. J. Nemanich (Physics), A. Reisman (Electrical and Computer Engineering), V. T. Stannett (Chemical Engineering).

The Department of Materials Science and Engineering offers programs to qualify graduates for positions in industry, educational institutions, and governmental agencies involving design, development, selection, and processing of engineering materials. Typical of the industries served by graduates in materials engineering are: aerospace, chemical, electrical, electronics, construction, manufacturing, materials processing, nuclear, and transportation.

OPPORTUNITIES

The continuing industrial and technological growth of the Southeast in general and of the State of North Carolina in particular has been marked by a particularly strong demand for materials scientists and engineers. New materials and novel processing and/or fabrication methods are required by a large fraction of modern technology. Therefore, professional training in materials science and engineering provides career opportunities in a wide variety of industries from those which produce and/or use metals and glass or ceramics to microelectronic devices and plastics. These opportunities include careers in research and development of new materials and processes for producing them, failure analysis, product design and reliability, and technical management.

CURRICULUM IN MATERIALS SCIENCE AND ENGINEERING

The materials engineer must be able to deal with a wide range of phenomena that occur in metals, ceramics and polymers. The undergraduate curriculum is designed as a balanced program, treating the scientific and engineering principles applicable to all classes of materials, along with particular engineering and design concepts unique to each class of material. Further emphasis in a specialty area is provided by choosing from a recommended set of technical electives (9 credits) in ceramics, metals, polymers or microelectronic materials. The remaining required courses are distributed among mathematics, physical sciences, and the humanities and social sciences. The material science and engineering program, which is accredited by the Accreditation Board for Engineering and Technology (ABET), leads to the degree Bachelor of Science in Materials Science and Engineering.

A fifth year professional program is available for advanced study and further specialization.

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 107 Chem. Principles & Appl. *or*	
E 100 Introduction to COE	0	CSC 110-112 Intro. to Computing	4-3
E 115 Intro. to Computing Envir.	1	ENG 112 Composition and Reading	3
ENG 111 Composition and Rhetoric	3	MA 241 Analytic Geometry & Calc. II	4
MA 141 Analytic Geometry & Calc. I	4	PY 205 Physics for Engr. & Scient. I	4
PE 100 Health & Physical Fitness	1	Physical Education Elective	1
Humanities/Social Science Elective	3		15-16
	16		

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CSC 110/112 Intro. Comp.—FORTRAN/ Pascal *or*		ECE 331 Prin. Electrical Engr. I	3
CH 107 Principles of Chemistry	3-4	MA 341 Appl. Differential Eqns. I	3
MA 242 Analytic Geometry & Calc. III	4	MAE 206 Engineering Statics	3
MAT 201 Struct. & Prop. Engr. Mat'ls.	3	MAT 301 Equil. & Rate Processes	3
MAT 210 Expr. in Mat'ls. Engr.	1	Humanities/Social Science Electives	6
PY 208 Physics for Sci. & Engrs. II	4		18
Physical Education Elective	1		
	16-17		

JUNIOR YEAR

Fall Semester	*Credits*
MAE 314 Solid Mechanics	3
MAT 324 Polymer Char. Lab	1
MAT 325 Intro. Polymer Mat.	4
MAT 330 Prin. Mat'ls. I	3
MAT 410 Comp. Appl. Met. Engr.	3
Humanities/Social Science Elective	3
	17

Spring Semester	*Credits*
MAT 321 Phase Transf. & Diff.	3
MAT 331 Prin. Mat'ls. II	3
MAT 434 Ceramic Engr. Lab.	1
MAT 435 Physical Ceramics I	3
MAT 450 Mech. Prop. Mat.	3
Free Elective	3
Physical Education Elective	1
	17

SENIOR YEAR

Fall Semester	*Credits*
MAT 332 Prin. Mat'ls. III	3
MAT 423 Mat. Factors in Design	3
MAT 430 Phys. Met. Lab.	1
MAT 431 Physical Metal. I	4
MAT 491 Mat'ls. Engr. Seminar	(1)
Humanities/Social Science Elective	3
MAT Technical Elective[2]	3
	17(18)

Spring Semester	*Credits*
MAT 424 Senior Design Project	3
MAT 491 Mat'ls. Engr. Seminar	1
MAT 491 Mat'ls. Engr. Seminar	(1)
Humanities/Social Science Elective	3
MAT Technical Elective	3
Free Electives	6
	16(15)

Minimum Hours Required for Graduation ... 134

[1]MAT Technical Electives to be selected from the specialty area courses listed.
[2]MAT 491 Seminar may be taken either semester.

SPECIALTY AREAS

Six credits of technical electives are required. If a specialty area is chosen, one of the following sequences of technical electives is recommended. Other technical elective sequences may be selected with departmental approval.

Ceramic Materials

MAT 311—Ceramic Processing I ... 3
MAT 417—Ceramic Engineering Design ... 3
MAT 436—Physical Ceramics II ... 3

Metallic Materials

MAT 432—Physical Metallurgy II ... 3
MAT 440—Proc. Metallic Mat'ls. ... 3

Polymeric Materials

MAT 490A—Polymeric Materials Engineering .. 3
MAT 490B—Polymer Processing ... 3

Electronic Materials

ECE 441—Introduction to Solid-State Devices ... 3
MAT 460—Electronic Materials ... 3
MAT 495B—Elect. Mat'ls. Lab ... 1

MINOR IN MATERIALS SCIENCE AND ENGINEERING

The minor in Materials Science and Engineering is designed to provide students with the fundamentals necessary for advanced study in materials science and engineering and/or employment in materials related fields. The Materials Science and Engineering minor offers a structured program that allows students in disciplines other than Materials to become familiar with the common features of all materials and to gain a deeper knowledge of at least one subdiscipline within the materials field. This knowledge will help many students in their careers in industry or graduate school. Requirements for the minor include a minimum of 16 credit hours consisting of ten hours of specified MAT courses and 6-7 hours of additional courses. The GPA for the minor courses must be at least 2.0.

MECHANICAL AND AEROSPACE ENGINEERING

Broughton Hall (Room 3211)

Professor J. A. Bailey, *Head of Department*

Professor J. A. Edwards, *Associate Head of Department for Mechanical Engineering Program*

Professor J. N. Perkins, *Associate Head of Department for Aerospace Engineering Program*

Professor J. C. Mulligan, *Graduate Administrator*

Lecturer A. S. Boyers, *Undergraduate Administrator*

Alumni Distinguished Undergraduate Professors: E. M. Afify, M. A. Boles, R. R. Johnson

Alumni Distinguished Graduate Professors: M. N. Ozisik, F. R. DeJarnette

R. J. Reynolds Industries Professors: W. C. Griffith, C. F. Zorowski

Professors E. M. Afify, J. A. Bailey, F. R. DeJarnette, T. A. Dow, J. A. Edwards, F. D. Hart, H. A. Hassan, T. H. Hodgson, E. G. Humphries, G. K. F. Lee, C. J. Maday, J. C. Mulligan, M. N. Ozisik, J. N. Perkins, L. H. Royster, F. O. Smetana, F. Y. Sorrell, J. S. Strenkowski, C. F. Zorowski; *Adjunct Professors:* J. M. Bounds, R. L. Bradow, C. T. Crowe, G. Horvay, J. N. Juang, D. E. Klett, E. R. McClure, G. D. Walberg, R. A. Whisnant; *Visiting Professor and Extension Specialist:* M. M. Fikry; *Professors Emeriti:* R. A. Burton, M. H. Clayton, B. H. Garcia, Jr., W. C. Griffith, F. J. Hale, J. K. Whitfield, J. Woodburn; *Associate Professors:* M. A. Boles, J. W. David, A. C. Eberhardt, R. R. Johnson, R. F. Keltie, C. Kleinstreur, J. N. Leach, D. S. McRae, R. T. Nagel, L. M. Silverberg, S. Torquato; *Associate Professor and Extension Specialist:* H. M. Eckerlin; *Adjunct Associate Professors:* J. P. Archie, R. N. Armstrong, R. W. Barnwell, J. F. Campbell, P. B. Carson, D. L. Dwoyer, R. M. Hall, J. H. Hebrank, K. R. Iyer, D. W. Lee, D. L. Margolis, R. M. Potter, M. J. Ruiz, H. Singh, J. S. Stewart; *Assistant Professors:* G. V. Candler, N. Chokani, J. W. Eischen, C. E. Hall, R. D. Gould, E. C. Klang, P. I. Ro, C. E. Spiekermann, F. G. Yuan; *Adjunct Assistant Professors:* M. M. Cohen, D. P. Colvin, J. P. Coulter, J. U. Crowder, J. A. Daggerhart, P. A. Gnoffo, A. L. Patra, T. W. Sigmon, M. E. Tauber, M. A. Ward, W. J. Yanta; *Lecturers:* G. O. Batton, A. S. Boyers, R. J. Leuba, G. M. Moorefield, R. J. Vess; *Visiting Instructor:* T. H. Brown; *Adjunct Instructors:* H. G. Hoomani, D. W. Lindley; *Interinstitutional Adjuncts:* P. H. DeHoff, K. M. Whatley.

Mechanical engineering comprises a wide range of activities including research; design and development; testing and experimentation; production implementation; manufacturing; operations; engineering sales and service; and management of engineering systems, subsystems and components. The diverse areas to which mechanical engineers contribute include transportation, power generation, energy conversion, environmental control, pollution abatement, manufacturing, and noise control. A recent trend in one phase of mechanical engineering has been increased interest in the areas of robotics, precision engineering, and automated manufacturing systems.

The employment demand for graduates in mechanical engineering typically exceeds the supply and is among the highest of the various engineering departments.

Aerospace engineering has grown out of the challenge of the design, construction, and operation of vehicles that move or travel above the earth's surface. These vehicles range from ground-effect machines and helicopters to aircraft, rockets, and spacecraft. The design of these vehicles is difficult not only because they must be lightweight but also because they must operate reliably and efficiently in a harsh environment. Moreover, the design requirements for spacecraft and high performance transport aircraft also apply to the next generation of ground transportation systems such as high speed trains, over-water transport, and automated motor vehicles.

Most graduates in aerospace engineering prefer to seek employment in the aerospace industry, however, they are broadly qualified for a variety of kinds of practice. Every major class of thermal and mechanical system is included in aerospace vehicles. The aerospace industry is one of the largest employers of engineers in the United States. Career and employment opportunities are available in the areas of aerodynamics, propulsion, structures, structural dynamics, and stability and control in both commercial and private aviation, and in related aerospace industries.

FACILITIES

Laboratories include research facilities in acoustics, automotive engine pollution and performance, computer-aided-design and computer graphics, the effect of shock loading on materials, machine tool wear and mechanics, applied energy systems including a complete solar house, precision engineering, and boundary layers on airfoils.

Undergraduate laboratories exist for the following courses and activities: mechanical engineering measurements, performance evaluation of mechanical engineering systems, senior projects in machine and system design, senior projects in aerospace vehicle design, and subsonic and supersonic wind tunnel testing and data analysis. In addition there are graduate laboratories in experimental stress analysis and photoelasticity. Further, the department has a complete machine shop and electronics and instrumentation shop and related technicians.

OPPORTUNITIES

The flexibility and breadth of the mechanical engineering curriculum culminates in a broad range of employment opportunities in machinery and power related applications the world over. Mechanical engineers work at the heart of development of computer controlled devices, vehicles and production machinery. They are well qualified for employment in production or product planning and for industrial management. Many go into research and development after graduate study.

The aerospace engineers prefer the aerospace industry, but are broadly qualified for a variety of kinds of practice. Every major class of thermal and mechanical system is included in aerospace vehicles. The aerospace industry is one of the largest employers of engineers in the United States. Career and employment opportunities are available in the areas of aerodynamics, propulsion, structures and stability and control in both commercial and private aviation and in related aerospace industries.

CURRICULA

Because of the close relationship between mechanical and aerospace engineering, both curricula are administered by one department. There is cooperation between the two disciplines in which responsibility for subject areas such as thermodynamics, heat and mass transfer, vibrations, acoustics, fluid mechanics, propulsion and control theory is shared.

Each program is designed to provide the student with an understanding of both the science on which the discipline is founded and the applied science and technology which characterizes its specific character. In addition the programs provide the student with an opportunity to develop the skills for applying his or her acquired knowledge. The aerospace engineering and the mechanical engineering programs, which are accredited by the Accreditation Board for Engineering and Technology (ABET), lead to the degrees Bachelor of Science in Aerospace Engineering, and Bachelor of Science in Mechanical Engineering, respectively. Graduate degrees are also offered (see listing of graduate degrees offered and consult the Graduate Catalog).

MECHANICAL ENGINEERING CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CSC 112 Intro. to Comp.—FORTRAN	3
E 100 Introduction to COE	0	ENG 112 Composition and Reading	3
E 115 Intro. to Computing Envir.	1	MA 241 Analytic Geometry & Calc. II	4
ENG 111 Composition and Rhetoric	3	PY 205 Physics for Engr. & Scient. I	4
MA 141 Analytic Geometry & Calc. I	4	Physical Education Elective	1
PE 100 Health & Physical Fitness	1		15
Humanities/Social Science Elective	3		
	16		

SOPHOMORE YEAR

Fall Semester	*Credits*
GC 101 Engineering Graphics	2
MA 242 Analytic Geometry & Calc. III	4
MAE 206 Engineering Statics	3
PY 208 Physics for Scientists & Engineers II	4
Humanities/Social Science Elective	3
Physical Education Elective	1
	17

Spring Semester	*Credits*
MA 302 Num. Appl. to Diff. Eq.	1
MA 341 Appl. Diff. Equations I	3
MAE 208 Engr. Dynamics[2]	3
MAE 314 Solid Mechanics	3
MAT 201 Struct. & Prop. of Engr. Matr.	3
Humanities/Social Science Elective[1]	3
Physical Education Elective	1
	17

JUNIOR YEAR

Fall Semester	*Credits*
ECE 331 Prin. of Elec. Engr. I	3
MAE 301 Engr. Thermo I[3]	3
MAE 305 Mech. Engr. Lab I	1
MAE 315 Dynamics of Machines	3
MAE 316 Strength of Mech. Comp.	3
Humanities/Social Science Elective[1]	3
	16

Spring Semester	*Credits*
IE 311 Engr. Economic Analysis	3
MAE 302 Engr. Thermo II	3
MAE 306 Mech. Engr. Lab II	1
MAE 308 Fluid Mechanics I	3
MAE 310 Conduct. & Radia. Heat Transfer	3
Humanities/Social Science Elective[1]	3
	16

SENIOR YEAR

Fall Semester	*Credits*
MAE 405 Mech. Engr. Lab III	1
MAE 410 Conv. Heat Trans. Fluid Flow	3
MAE 415 Mech. Engr. Analysis	3
MAE 435 Prin. of Auto. Controls	3
Free Electives	6
	16

Spring Semester	*Credits*
MAE 412 Energy Systems	3
MAE 416 Mechanical Engr. Design	4
Departmental Elective	3
Humanities/Social Science Elective	3
Free Elective	3
	16

Minimum Hours Required for Graduation .....133[4]

Students may elect to take PY 201, 202 and 203 in place of PY 205, 208. Rearrangement of the schedule of courses to accomplish this will be worked out in consultation with the student's adviser.

[1]See information concerning the humanities, social science sequence for College of Engineering.
[2]A grade of C or better is required in MAE 208 before taking MAE 315.
[3]A grade of C or better is required in MAE 301 before taking MAE 302 and MAE 310.
[4]A 2.0 in the major GPA and the overall GPA are required for graduation.

AEROSPACE ENGINEERING CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*
CH 101 General Chemistry I	4
E 100 Introduction to COE	0
E 115 Intro. to Computing Envir.	1
ENG 111 Composition and Rhetoric	3
MA 141 Analytic Geometry & Calc. I	4
PE 100 Health & Physical Fitness	1
Humanities/Social Science Elective	3
	16

Spring Semester	*Credits*
CH 105 Chem. Principles & Appl.	3
ENG 112 Composition and Reading	3
MA 241 Analytic Geometry & Calc. II	4
PY 205 Physics for Engr. & Scient. I	4
Physical Education Elective	1
	15

SOPHOMORE YEAR

Fall Semester	*Credits*
CSC 112 Intro. to Computing—FORTRAN	4
MA 242 Analytic Geometry & Calc. III	4
MAE 206 Engr. Statics	3
PY 208 Physics for Scientists & Engineers II	3
Humanities/Social Science Elective[1]	3
Physical Education Elective[5]	1
	18

Spring Semester	*Credits*
GC 101 Engineering Graphics	2
MA 341 Appl. Diff. Equations I	3
MAE 208 Engineering Dynamics	3
MAE 261 Aero. Vehicle Performance	3
MAE 314 Solid Mechanics	3
MAT 201 Struct. of Engr. Mat.	3
Physical Education Elective[5]	1
	18

JUNIOR YEAR

Fall Semester		*Credits*
ECE 331	Prin. of Elec. Engr.	3
ECE 339	Prin. of Elec. Engr. Lab	1
MAE 301	Engr. Thermodynamics I[3]	3
MAE 355	Aerodynamics I	3
MAE 357	Aerodynamics I Lab	1
MAE 371	Aero. Vehicle Struct. I	3
Humanities/Social Science Elective[1]		3
		17

Spring Semester		*Credits*
MAE 356	Aerodynamics II	3
MAE 358	Aerodynamics II Lab	1
MAE 365	Propulsion I	3
MAE 435	Principles of Automatic Control	3
MAE 472	Aero. Vehicle Struct. II	3
MAE 473	Aero. Vehicle Struct. II Lab	1
Humanities/Social Science Elective[1]		3
		17

SENIOR YEAR

Fall Semester		*Credits*
MAE 455	Boundary Layer Theory	3
MAE 462	Flight Veh. Stab. & Con.	3
MAE 465	Propulsion II	3
MAE 466	Propulsion II Lab	1
MAE 478	Aero. Vehicle Design I	2
Humanities/Social Science Elective[1]		3
Free Elective[5]		3
		18

Spring Semester		*Credits*
MAE 479	Aero. Vehicle Design II	3
Departmental Elective[4]		3
Humanities/Social Science Elective[1]		3
Free Electives[5]		6
		15

Minimum Hours Required for Graduation ...134[2]

[1]See information concerning the humanities/social science sequence for the College of Engineering.
[2]A GPA of 2.0 or better is required for both (a) all courses taken at NCSU and (b) for all MAE courses.
[3]C Minimum in MAE 301 is required before enrolling in MAE 356 and MAE 525.
[4]Departmental electives are MAE 452, MAE 453, MAE 456, MAE 525, and MAE 526. Other courses may be approved by AE adviser.
[5]To be counted towards graduation, only free elective and PE courses may be taken credit-only.

NUCLEAR ENGINEERING

Burlington Engineering Laboratories (Room 1110-B)

Professor D. L. Dudziak, *Head of the Department*

Professor R. P. Gardner, *Coordinator of Advising*

Alumni Distinguished Undergraduate Professor: K. Verghese

Professors: D. L. Dudziak, R. P. Gardner, J. G. Gilligan, K. L. Murty, P. J. Turinsky, K. Verghese, B. W. Wehring; *Professors Emeriti:* R. L. Murray, R. F. Saxe, E. Stam, L. R. Zumwalt; *Associate Professor:* J. M. Doster; *Assistant Professors:* D. Bullen, O. E. Hankins; *Lecturer and Health Physicist:* K. V. Mani; *Associate Director of Nuclear Reactor Program:* G. D. Miller; *Nuclear Services Manager:* J. N. Weaver.

Nuclear engineering is concerned with the engineering aspects of the control, release and utilization of nuclear energy from both fission and fusion. Nuclear reactors serve many functions—they serve as heat sources for electric power plants, are the basis of modern propulsion systems for ships and submarines, and produce fissionable and radioactive isotopes for a variety of peaceful applications. Nuclear methods are applied in medical diagnosis and treatment, scientific research, and the search for new resources. The nuclear engineering program educates individuals in scientific and engineering principles essential for effective and productive contributions in industrial, university and government service.

The Nuclear Engineering Program, which is accredited by the Accreditation Board for Engineering and Technology (ABET), leads to the degree Bachelor of Science in Nuclear Engineering.

OPPORTUNITIES

Nuclear power reactor construction continues with over one hundred reactors now operating in the nation, increasing our reliance upon nuclear energy as a substitute for energy from fossil fuels. Development of breeder and fusion reactors offers the potential of

vast new energy sources. Industrial and medical applications of radiation continue to increase in diverse industries. A demand for nuclear engineers exists within the electric power industry and national laboratories.

SCHOLARSHIPS AND AWARDS

Several special scholarships exist for NCSU nuclear engineering students, including the Bechtel, Carolina Power and Light, Ebasco, Eastern Carolinas ANS, Institute for Nuclear Power Operations, and American Nuclear Society scholarships. A special department fund supports scholarships for incoming freshmen. NCSU nuclear engineering students have gained national recognition by several times receiving the Student Design Award of the American Nuclear Society and being recipients of nationally awarded fellowships.

FACILITIES

Facilities for nuclear education include: a nuclear research reactor (PULSTAR), which can be operated at a steady state power of 1 MW; the Scaled Pressurized Water Reactor facility (SPWR), an operating 1/9 scale model of a nuclear power plant; radiation detectors and multi-channel analyzers; nuclear materials laboratory; thermal hydraulic laboratory; prompt gamma facility; neutron radiography unit; numerous computer facilities including graphic terminals, access to the NCSU IBM 3090 supercomputer and the North Carolina Supercomputing Center CRAY Y-MP, an Alliant FX/4 parallel mini supercomputer, VAX 11/750 minicomputer, several engineering workstations, and numerous microcomputers (PCs); fusion laboratory; neutron activation analysis laboratory, and high-and low-level radiochemistry laboratories.

CURRICULUM

Nuclear engineers work in nuclear systems research, design, development, testing, operation, environmental protection, and marketing. The Bachelor of Science program prepares graduates for positions in industry, government laboratories or for graduate study (see listing of graduate degrees offered). The curriculum incorporates basic sciences and engineering, with emphasis on mathematics and physics, followed by coursework in nuclear science and technology. Attention is given to the engineering design of nuclear reactors and nuclear radiation systems and to energy resources and environmental aspects of nuclear energy. Computers are widely used through the curriculum.

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 107 Principles of Chemistry	4
E 100 Introduction to COE	0	ENG 112 Composition and Reading	3
E 115 Intro. to Computing Envir.	1	MA 241 Analytic Geometry & Calc. II	4
ENG 111 Composition and Rhetoric	3	PY 205 Physics for Engr. & Scient. I	4
MA 141 Analytic Geometry & Calc. I	4	Physical Education Elective	1
PE 100 Health & Physical Fitness	1		16
Humanities/Social Science Elective	3		
	16		

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CSC 112 Intro. to Comp.—FORTRAN	3	CE 213 Introduction to Mechanics	3
MA 242 Analytic Geometry and Calc. III	4	MA 341 Applied Diff. Equations I	3
NE 201 Intro. to Nuclear Engineering	2	NE 202 Fundamentals of Nuclear Energy	4
PY 208 Physics for Scientists & Engineers II	4	PY 407 Intro. Mod. Physics	3
Humanities/Social Science Elective	3	Humanities/Social Science Elective	3
Physical Education Elective	1	Physical Education Elective	1
	17		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ECE 331 Principles of Electrical Engr.	3	MA 401 Applied Diff. Equations II	3
MAE 301 Engr. Thermodynamics I	3	NE 302 Nucl. Reactor Energy Conversion	4
MAE 308 Fluid Mechanics I	3	NE 401 Reactor Analysis and Design	4
NE 301 Funda. of Nuclear Engr.	4	MAT 201 Struct. Prop. of Engr. Mat'ls.	3
Humanities/Social Science Elective	3	Free Elective	3
	16		17

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
NE 402 Reactor Engineering	4	NE 403 Nuclear Engr. Design Proj.	3
NE 404 Radiol. Reactor & Environ. Safety	3	NE 409 Nuclear Materials	2
NE 405 Reactor Systems	3	Approved Technical Elective[1]	3
Humanities/Social Science Elective	3	Approved NE Elective[1]	3
Free Elective	3	Humanities/Social Science Elective	3
	16	Free Elective	3
			17

Minimum Hours Required for Graduation ... 132

[1]Courses must be taken from the departmental list of approved courses.

TEXTILE ENGINEERING

(Also see College of Textiles)

Nelson Textile Building (Room 126)

Professor C. D. Livengood, *Head of the Department of Textile Engineering, Chemistry, and Science*

Professor B. S. Gupta, *Assistant Head*

Professor G. N. Mock, *Program Director*

(For a list of faculty, see Textile Engineering, Chemistry, and Science)

The textile industry are rapidly changing to become a capital intensive, high-technology industry. Applications of computers and robotics are commonplace in the modern plant. Textile engineering is concerned with the application of scientific principles and engineering practice to the design and control of all aspects of fiber, textile and apparel processes, products and machinery. These include natural and man-made fibers, composites, safety and health, pollution control and energy conservation and management.

Modern textiles are crucial major components of emerging developments in the medical, space, aeronautical and communications fields. Artificial kidneys, bones, hearts and arteries, rocket shields, space shuttle nose cones and insulation, space suits, composite airplane bodies—all involve the use of textile fibers and fabrics to produce engineered structures. Structural- and geo-textiles are used in a large number of applications, such as water desalination, stadium roofs, air supported buildings, reservoir liners, road beds and composites.

The Textile Engineering program, which is accredited by the Accreditation Board for Engineering and Technology (ABET), leads to the degree of Bachelor of Science in Textile Engineering.

FACILITIES AND SCHOLARSHIPS

(See College of Textiles)

OPPORTUNITIES

Because the modern production and utilization of textile materials requires young people highly competent in the areas of engineering, mathematics, science and technology, graduates of the program are prepared for challenging careers in the primary textile, man-made fiber, apparel and nonwovens industries, as well as the textile machinery, automotive, aerospace and construction industries. Opportunities abound in plant engineering, design engineering, production control, process engineering, product development, microelectronics, robotics and automation.

TEXTILE ENGINEERING CURRICULUM

The Textile Engineering program investigates how scientific principles and engineering practices can be applied to the diverse requirements of textile materials, processes, structures and machinery. The program combines study of textile, physical, mathematical and social sciences with engineering analysis and design techniques. Students study the interaction of fibers and fabrics with machinery, as well as consider such issues as safety and health, pollution control, and energy management. Completion of a B.S. in Textile Engineering provides the individual with a broad engineering background suited to addressing textile engineering problems.

Since training in textile engineering involves two distinct technical fields—textiles and engineering—the curriculum is a joint responsibility of the two colleges and is so administered.

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CSC 112 Intro. to Comp.—FORTRAN	3
E 100 Introduction to COE	0	ENG 112 Composition and Reading	3
E 115 Intro. to Computing Envir.	1	MA 241 Analytic Geometry & Calc. II	4
ENG 111 Composition and Rhetoric	3	PY 205 Physics for Engr. & Scient. I	4
MA 141 Analytic Geometry & Calc. I	4	Physical Education Elective	1
PE 100 Health & Physical Fitness	1		15
Humanities/Social Science Elective	3		
	16		

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
GC 101 Engineering Graphics	2	MA 341 Applied Differential Equations	3
MA 242 Analytic Geometry & Calc. III	4	MAE 208 Engineering Dynamics *or*	
MAE 206 Engineering Statics *or*		CE 215 Engr. Mechanics—Dynamics	3
CE 214 Engineering Mechanics—Statics	3	MAE 314 Solid Mechanics *or*	
PY 208 General Physics II	4	CE 313 Mechanics of Solids	3
Free Elective	3	ST 361 Intro. to Statistics for Engr.	3
Physical Education Elective	1	TE 201 Polymer & Fiber Sci. & Engr.	4
	17	Humanities/Social Science Elective[1]	3
			19

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ECE 331 Prin. of Electrical Engr. I	3	ECE 332 Prin. of Electrical Engr. II *or*	
MAE 301 Engr. Thermodynamics I	3	MAE 435 Prin. of Auto Controls	3
MAE 308 Fluid Mechanics I	3	ENG 331 Commun. Engr. & Tech. Info.	3
TE 301 Textile Manuf. Process I	4	TAM 380 Mgmt. & Cont. of Textile Sys.	3
Humanities/Social Science Elective[1]	3	TE 302 Textile Manuf. Process II	4
Physical Education Elective	1	Humanities/Social Science Elective	3
	17	Free Elective	3
			19

SENIOR YEAR

Fall Semester	*Credits*
TE 303 Textile Chemical Processes	4
TE 401 Textile Engineering Design I	4
TE 403 Mechanics of Fibrous Structures	3
Engineering Elective[2]	3
Humanities/Social Science Elective	3
	17

Spring Semester	*Credits*
TE 402 Textile Engineering Design II	4
TE 404 Textile Process Quality Control	4
Humanities/Social Science Elective	3
Free Elective	3
	14

Minimum Hours Required for Graduation ... 134

NOTE: All courses taken to satisfy the humanities/social science requirement must be taken from the College of Engineering approved list.

[1]EB 201 should be taken prior to the spring semester of the junior year.

[2]CHE 311, IE 311, ECE 305, ECE 332, MAE 302, MAE 315, MAE 435, or MAT 201.

PROFESSIONAL DEGREES

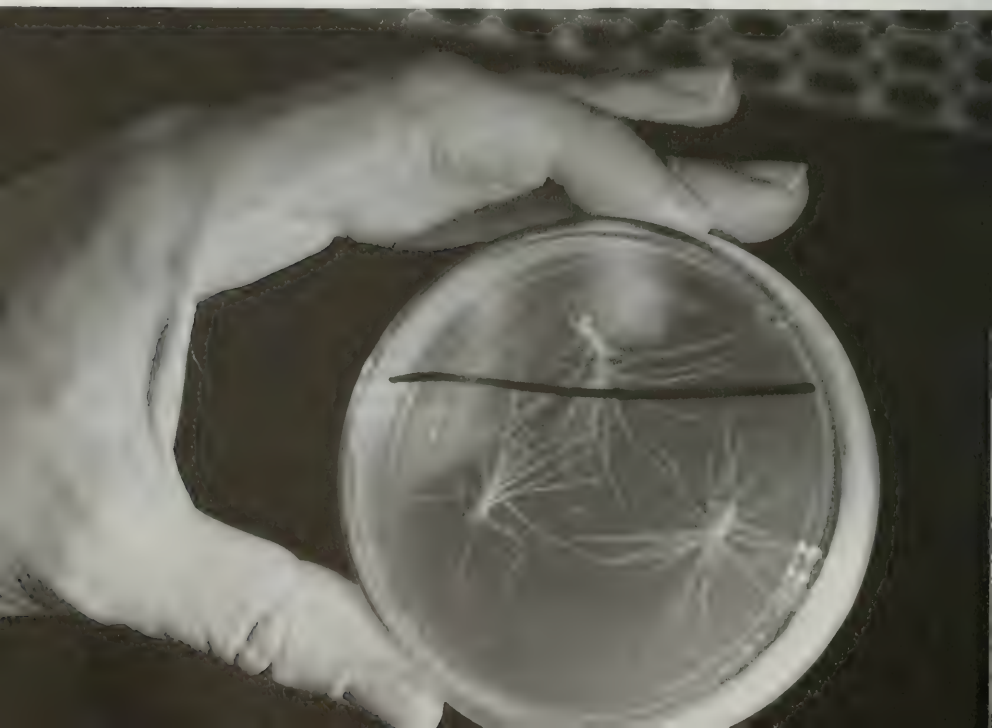
The College of Engineering offers professional curricula leading to the degrees of Chemical Engineer, Civil Engineer, Electrical Engineer, Industrial Engineer, Materials Engineer, Mechanical Engineer, and Nuclear Engineer. This program is designed for engineering students holding baccalaureate degrees who find that an additional year of education is desirable, for practicing engineers who desire to take a year of professional work to update their training, and for students holding physical sciences or mathematics degrees who seek a professional level of education in engineering. The program is intended to be sufficiently flexible to meet a wide variety of student needs, and to emphasize professional course work. The curriculum consists of a minimum of 30 hours of credit at the 400 level or above, including at least 15 hours of credit at the 500 level or above.

Applicants who hold the bachelor's degree in engineering, physical sciences, or mathematics may be admitted to the professional program of the College of Engineering upon application and presentation of official credentials. For unconditional admission, these credentials must show a minimum grade point average of 2.5 overall. Admission on a provisional basis may be granted to applicants who do not meet the formal requirements. In the case of insufficient preparation, prerequisite courses will be prescribed in addition to the normal fifth-year requirements.

The following requirements of the College of Engineering will be observed:

1. Professional degree students are admitted through the Undergraduate Admissions Office as fifth-year professional degree (PR) students. They are subject to rules and regulations as established and administered by the Dean of the College of Engineering.
2. Application forms for admission to the professional degree program should be completed and submitted to the Assistant Dean for Academic Affairs at least 60 days in advance of the semester in which admission is sought. Acceptance of a student for the professional program is based on the recommendation of his department and the approval of the Assistant Dean for Academic Affairs. At the time of acceptance, N.C. State University students may transfer a limited number of excess credits to their professional program.
3. A limited amount of credit to be applied toward the requirements for the professional degree may be transferred to N.C. State University from recognized institutions offering advanced work in engineering and related fields. Such a transfer of credit must be approved by the department in which the student does his or her major work and by the Dean of the College of Engineering.
4. A graduate in one field of engineering may choose to work for a professional degree in another field provided he or she has the permission of the department. The student will be expected to take necessary prerequisite courses in addition to those required for the professional degree program.

5. Each fifth-year student will be assigned to an advisor in the sponsoring department. The function of the advisor is to assist the student in preparing a program of study and to counsel the student with regard to his or her academic work. Prior to the midterm of the first semester, the student and his or her advisor should agree on a program of study for the professional degree. Program of Study for Professional Degree forms will be prepared and submitted to the office of the Assistant Dean for Academic Affairs as well as to the department. Upon approval of the Office of the Dean, this becomes the student's degree program.
6. Grades for each completed course are reported to the Dean of the College of Engineering and to the Office of Registration. A minimum grade of "C" must be made in each course to obtain credit. A quality point average of 2.5 in all course work must be maintained to satisfy requirements for a professional degree.
7. All courses taken by the student after admission to the professional program will count toward the overall grade point average even though an individual course may not be a part of the degree program.
8. A student who falls below 2.5 average will be placed on probation and given one semester to raise the overall average up to a 2.5. If the student has been admitted on a provisional basis, he or she must make a 2.5 average the first semester in order to continue.
9. Work completed more than six years prior to the date on which the professional degree is to be granted may not be used as credit toward the professional degree, unless approved by the head of the department concerned and the Assistant Dean for Academic Affairs.
10. A professional degree student who has been admitted to the Graduate School may, with the approval of a Master's Degree committee and the Graduate School, transfer nine hours of credit for courses in which a grade of B or higher was received.
11. A student may transfer only once; that is, from the Professional Degree Program to the Graduate School or from the Graduate School to the Professional Degree Program. Therefore, a student is not permitted to return to either program after having transferred from that degree program.
12. It is intended that professional degree students will complete a substantial portion of credit hours toward the degree while in residence on the NCSU campus.



COLLEGE OF FOREST RESOURCES

Biltmore Hall (Room 2028)

L. W. Tombaugh, *Dean*

E. B. Cowling, *Associate Dean for Research*

J. D. Wellman, *Associate Dean for Academic Affairs and Coordinator of Advising*

J. P. Abbott, *Forest Resources Librarian*

The management and utilization of the South's forest resources and products provide opportunities for challenging professional careers. Forests provide a variety of goods—timber, water, wildlife and recreation environments—vital to the economy and well being of North Carolina. Graduates of the college are qualified for professional positions managing forest lands, or producing the products or managing the services developed from these lands. Emphasis is placed on natural renewable resource management because the wise use of the products and amenities that can be derived from forest lands is central to preserving environmental quality and the quality of life.

North Carolina is an important forest state. Its 19 million acres of commercial forest land, comprising two-thirds of the state's land area, form the base for goods and services valued at over ten billion dollars annually. Nearly 20 percent of the state's industrial labor force is associated with forest based organizations; forests support the southern region's largest industry. New wood-using industries continue to move into the South, creating multi-billion dollar outputs. Similarly, recreational activities continue to expand as a result of growing population, affluence, mobility and leisure time.

As a result of this growth, forest based industries and governmental agencies need well-educated, technically competent personnel.

Some of the programs in the College of Forest Resources are not duplicated in other southern universities, so the Trustees of the University and the Southern Regional Education Board have designated them as regional in nature.

DEGREE PROGRAMS

Five curricula are administered in the college through its Departments of Forestry, Parks, Recreation and Tourism Management, and Wood and Paper Science. These programs provide a broad education in the biological and physical sciences as well as a sound cultural and professional background. Students are prepared for careers in the fields of conservation, forestry, parks, recreation and tourism management, pulp and paper science and technology, and wood science and technology.

Freshmen have a nearly common core of courses during the first semester allowing deferment of the final selection of a curriculum for two or three semesters. To assist students with a better understanding of their major area of study, introductory courses are given in each curriculum.

Graduate degrees offered include: Master of Science, Master of Forestry, Master of Recreation Resources, Master of Wood and Paper Science, and the Doctor of Philosophy. Applicants should consult the Graduate Catalog for additional information about these programs.

FIELD INSTRUCTION AND EXPERIENCE

All students (except those in conservation) are required to complete the equivalent of one or more of the following summer activities: (1) camp, (2) internship, (3) practicum, (4) work experience.

A summer camp which normally follows the sophomore year is required of all forestry students.

Undergraduates enrolled in parks, recreation and tourism management, complete a nine-week internship immediately following the completion of the junior year.

All pulp and paper majors spend at least one summer working in a pulp and paper mill designated by the school.

Wood science and technology students attend a summer practicum following the sophomore year.

Additional field instruction and scheduled trips to representative industries and agencies are required frequently as a part of regular class assignments.

HONORS PROGRAM

Students making exceptional academic records during their freshman and sophomore years may, with faculty approval, follow an honors program. Honors students develop more rigorous programs of study, frequently taking advanced courses in mathematics, chemistry, statistics and economics. With the adviser's consent honors students may substitute preferred courses for normally required courses in order to develop strength in special interest areas. Honors students are required to undertake a program of independent study which can involve a research problem or special project during their junior or senior year, and they must participate in the senior honors seminar.

SCHOLARSHIPS

Academic scholarships (ranging from $1000 to $4,000) in several program areas are available for entering freshmen who have excelled in their high school academic and extracurricular endeavors. These awards include: (1) six renewable scholarships for entering students in the forestry major, (2) six renewable scholarships for students enrolling in the wood science and technology curriculum, and (3) twenty-five awards, renewable for up to four years, for students majoring in pulp and paper science and technology.

HONOR SOCIETIES

The College of Forest Resources has two honors societies—Xi Sigma Pi (for all majors within the college) and Rho Phi Lambda (for recreation majors)—that promote and recognize academic excellence. Students completing a minimum of one year of study with high academic achievement are invited to become members of these societies.

INTERNATIONAL ACTIVITIES

Students are exposed to international dimensions of their programs in a variety of ways. Many faculty members regularly travel abroad and several are active in major projects in foreign countries, including an international cooperative research project concentrating on Central America and Mexico. In addition, a significant number of foreign students enroll in the college, including in recent years from as many as 21 different countries from all parts of the world.

FOREST RESOURCES EXTENSION

The Forest Resources Extension program, a part of the Agricultural Extension Service, is the largest program of its type in the United States. It serves landowners, industries and public agencies in the areas of forestry, recreation, wildlife and wood and paper. Its primary responsibility is promoting the application of new ideas developed through research and experience.

In cooperation with the Division of Lifelong Learning, short courses are offered in a number of fields to provide industry and government employees an opportunity to keep abreast of modern developments in techniques and equipment.

FACILITIES AND LABORATORIES

Most classrooms are housed in Biltmore Hall. Among special education facilities in Forest Resources are: 80,000 acres in forests including the Hofmann Forest on the coastal plain; the Hill, Schenck, Hope Valley and Goodwin Forests in the Piedmont; and the Slocum summer camp at the Hill Forest in Durham county. Specialized laboratories unique to universities are contained in the Hodges Wood Products Laboratory and the Reuben B. Robertson Pulp and Paper Laboratory. Equipment in the Hodges Laboratory includes computer controlled woodworking machinery, dry kilns, sawmill veneer lathe and numerous other items required to convert wood into products. The Robertson Laboratory is a 50,000 sq. ft. facility which contains laboratories and modern pulping and papermaking equipment dedicated to teaching and research activities. Examples of equipment are secondary fiber recycling equipment, a thermo mechanical pulping unit, paper machine, process control equipment, paper testing laboratory, and pulping digesters.

CONSERVATION

(Also see Agriculture and Life Sciences.)

Associate Professor H. J. Kleiss, *Major Adviser, College of Agriculture and Life Sciences*

Professor A. W. Cooper, *Major Adviser, College of Forest Resources*

Problems resulting from the world's increasing population, rapid urbanization and industrialization, and environmental modifications affect our lives every day. Hazardous and radioactive waste, water and air quality degradation, the greenhouse effect, world food and energy supplies, destruction of tropical forests—all are symptomatic of increasing pressures to produce more food, fiber, and energy and to raise living standards. Challenges posed by these issues require knowledgeable and dedicated people to make sound natural resource decisions.

The Colleges of Forest Resources and Agriculture and Life Sciences, with strong programs in the natural sciences, jointly offer a baccalaureate program in conservation. Graduates from this program are prepared for careers in land use management, laboratory technology, soil and water conservation, and/or environmental education.

CURRICULUM IN CONSERVATION

Students may enroll in either Forest Resources or Agriculture and Life Sciences, depending on their primary area of interest in conservation. The freshman common core of courses for either school is acceptable. All students take a prescribed core of subjects in conservation plus specified courses in one of five concentrations: soil conservation; environmental technology; environmental education; natural resource management and administration; communications. A dual degree program involving the conservation curriculum with another curriculum, e.g., science education, pest management, recreation, soil science, forestry is very feasible and recommended.

Language (12 Credits)

COM (SP) 110	Public Speaking	3
ENG 111	Composition & Rhetoric	3
ENG 112	Composition & Reading	3
ENG 333	Commun. for Sci. & Res.	3

Social Sciences and Humanities (21 Credits)

EB 212	Econ. of Agriculture	3
PS 201	Intro. to American Government	3
Literature Elective		3
Electives		12

Physical and Biological Sciences
(28 Credits)

BS 100	General Biology *or*	
BO 200	Plant Life	4
CH 101	General Chemistry I	4
CH 103	General Chemistry II *or*	
CH 107	Principles of Chemistry	4
MA 111	Precalculus Algebra and Trig.	3
MA 121	Introduction to Calculus	4
PY 221	College Physics	5
ZO 201	General Zoology *or*	
BO 200	Plant Life	4

Physical Education and Free Electives
(13 Credits)

PE 100	Health & Physical Fitness	1
Physical Education		3
Free Electives		9

Departmental Requirements and Electives (56 Credits)

BO(ZO) 360	Introduction to Ecology	3
BO(ZO) 365	Ecology Laboratory	1
FOR 252	Fundamentals of Forest Management	3
FOR 401	Watershed Management	4
FOR 472	Renewable Resource Management	4
MEA 110	Geology I Lab	1
MEA 120	Elements of Physical Geology	2
RRA 241	Natural Resource Recreation	3
SSC 200	Soil Science	4
ST 311	Introduction to Statistics	3
ZO(FW) 221	Conservation of Natural Resources	3
ZO(RW) 353	Wildlife Management *or*	
ZO(FW) 420	Fishery Science	3
Biological Sciences Electives		6
Conservation Electives		16
Minimum Hours Required for Graduation		131

SOIL CONSERVATION CONCENTRATION

PM 111	Integrated Pest Management	1
SSC(BAE) 323	Water Management	4
SSC 361	Soil Resources and Land Use	3
SSC 452	Soil Classification	4
SSC 461	Soil Physical Properties Plant Growth	3
SSC 492	Senior Seminar in Soil Science	1
		16

ENVIRONMENTAL TECHNOLOGY CONCENTRATION[1]

BAE(CE) 578	Agricultural Waste Management[2]	3
FS 405	Food Microbiology	3
SSC 361	Soil Resources & Land Use	3
SSC 452	Soil Classification	4
ZO 419	Limnology	3
		16

[1]MB 401, Microbiology, is required biological sciences elective.
[2]or BAE(SSC) 323 Water Management

NATURAL RESOURCE MANAGEMENT AND ADMINISTRATION CONCENTRATION[3]

EB 307	Business Law I	3
EB 410	Public Finance	3
EB 436	Environmental Economics	3
FOR 491	Special Topics Forestry & Rel. Natural Resources *or*	
PS 491	Internship in Political Science *or*	
SSC 492	Senior Seminar in Soil Science	1-6
MEA 200	Introduction to Marine Environment	3
PS 312	Introduction to Public Administration	3
		16-21

[3]PS 202, State and Local Government and EB 301, Intermediate Microeconomics, are required social science electives.

ENVIRONMENTAL EDUCATION CONCENTRATION[4]

ED 203 Introduction to Teaching Mathematics & Science	3
ED 296D Special Topics in Science Edu.	1
ED 475 Methods of Teaching Science	3
Electives	9
	16

[4]PHI(ED) 304, Philosophy of Education, is a required elective.

COMMUNICATIONS CONCENTRATION[5]

COM (SP) 112 Basic Principles of Interpersonal Communication	3
COM (SP) 201 Persuasive Theory	3
ENG 214 Copyediting	3
ENG 215 Principles of News and Article Writing	3
COM (SP) 298 Special Projects in Speech-Communication *or* FOR 491 Special Topics Forestry & Rel. Natural Resources *or* SSC 492 Senior Seminar in Soil Science	1
Elective	3
	16

[5]SOC 302, Mass Communications, is a required social science elective.

FORESTRY

Biltmore Hall (Room 2018)

Professor Arthur W. Cooper, *Head of the Department*

Associate Professor James D. Gregory, *Assistant Department Head for Undergraduate Programs*

Professor D. Lester Holley, *Graduate Administrator*

Distinguished University Professor: E. B. Cowling

Alumni Distinguished Undergraduate Professor: R. R. Braham

Alumni Distinguished Graduate Professor and Carl Alwin Schenck Professor: C. B. Davey

Edwin F. Conger Distinguished Professor Emeritus: B. J. Zobel

Professors: D. A. Adams, F. E. Bridgwater (USFS), S. W. Buol, A. W. Cooper, E. B. Cowling, C. B. Davey, P. D. Doerr, M. H. Farrier, E. C. Franklin, D. J. Frederick, L. F. Grand, A. E. Hassan, D. L. Holley, Jr., W. T. Huxster, R. C. Kellison, S. Khorram, J. G. Laarman, R. A. Lancia, J. R. McGraw, G. Namkoong (USFS), R. L. Noble, R. R. Sederoff, A. G. Wollum; *Adjunct Professors:* G. L. DeBarr, G. F. Dutrow, J. D. Hair, N. E. Johnson, J. R. Jorgensen, A. Krochmal, D. A. MacKinnon, R. W. Stonecypher, W. E. Towell, C. G. Wells; *Professors Emeriti:* R. C. Bryant, W. L. Hafley, R. D. Hazel, W. M. Keller, W. D. Miller, T. O. Perry, R. J. Preston, L. C. Saylor, F. E. Whitfield, B. J. Zobel; *Associate Professors:* R. C. Abt, H. L. Allen, Jr., H. V. Amerson, R. R. Braham, R. I. Bruck, J. D. Gregory, L. H. Harkins, L. G. Jervis, J. B. Jett, R. Lea, J. P. Roise, R. J. Weir, J. N. Woodman; *Adjunct Associate Professors:* W. J. Barton, D. L. Bramlett, R. G. Campbell, J. E. deSteiguer, R. G. Haight, C. B. Webb; *Associate Professor Emeritus:* E. M. Jones; *Assistant Professors:* A. R. Gillespie, E. J. Jones, S. E. McKeand, W. D. Smith, P. W. Somers, A. M. Stomp, L. Tolley-Henry; *Adjunct Assistant Professors:* L. J. Frampton, W. E. Ladrach, R. B. McCullough, G. A. Ruark, H. D. Smith, M. M. Schoeneberger, H. K. Steen; *Instructors:* J. L. Bettis, G. B. Blank; *Adjunct Instructor:* R. W. Slocum; *Specialists:* W. E. Gardner, R. A. Hamilton; *Director of CAMCORE:* W. S. Dvorak; *Liaison Geneticist:* J. R. Sprague; *Research Associates:* J. A. Brockhaus, D. O'Malley, R. Whetten; *Research Assistants:* T. J. Albaugh, H. M. Cheshire, S. R. Colbert, C. S. Furiness, D. W. Hazel, S. Horton, K. C. Joyner, E. M. Lunk, D. L. Mengel, J. E. Mudano, D. T. Tew, A. Tohmaz, R. A. Wilson; *Associate Members of the Faculty:* H. A. Devine (Recreation Resources), F. B. Hain (Entomology), L. E. Hinesley (Horticultural Science), D. E. Moreland (USDA-Crop Science), R. R. Perdue (Recreation Resources), R. A. Powell (Zoology), R. R. Rucker (Economics & Business), R. R. Wilkinson (Landscape Architecture).

OPPORTUNITIES

The undergraduate program of the Department of Forestry at NCSU prepares students for professional challenges, personal growth, and a lifetime of service as managers of renewable natural resources. The curricula are designed to produce well-educated forestry graduates who have the basic knowledge, skills, flexibility and attitude needed for success in a wide variety of forestry or forestry-related careers.

Graduates are in demand by state and federal land-managing agencies, by industrial concerns growing wood as raw material, by state forestry and agriculture extension services, by forestry related organizations such as nurseries and landscape management firms, and by urban natural resource management agencies. Some graduates, after acquiring professional forestry experience, are self-employed as consultants and as operators or owners of forestry-related businesses.

CURRICULA

The Bachelor of Science degree is offered with two concentrations: Forest Management and Forest Science. The Forest Management concentration provides the broad-based forestry education needed for direct employment into positions in a wide variety of forestry or forestry-related organizations. The Forest Science concentration is designed to provide more extensive study in math and science and is particularly advised for students who may be considering graduate study. The Forest Science concentration provides a basic forestry education while incorporating more elective credits, greater flexibility, and more opportunity for specialization than the Forest Management concentration.

Instruction and practice in communications skills (both writing and speaking) are integrated into core forestry courses throughout the curricula. An experienced English instructor works with the forestry faculty to provide instruction and to develop and evaluate writing and speaking assignments that address the particular communication skills needed by successful foresters.

The use of computers is integrated into the curricula in a similar fashion. Introductory instruction in programming and the use of computers is provided in CFR 134. Practical assignments on the use of computers as a tool in forestry are integrated into the advanced forestry courses.

SUMMER CAMP

An intensive summer camp experience, with forestry field training in the Coastal Plain, Piedmont, and Mountain regions of North Carolina is required. The camp is based at the College's Hill Demonstration Forest with trips taken to other regions. Four-year students take summer camp after the sophomore year. In order to be eligible for summer camp a four-year student must (1) have made a C or better in ENG 111 and 112, (2) have passed BS 100 and MA 114 (or MA 242 or MA 231), and (3) have no more than one D in FOR 110 and 212.

DUAL DEGREE PROGRAMS

Programs have been arranged with other departments whereby students can obtain, in addition to the Bachelor of Science degree in forestry, a second Bachelor of Science degree in such areas as agricultural economics, conservation, entomology, recreation resources administration, wood science and technology, or fisheries and wildlife science. These joint programs usually require additional credits above the forestry electives and free elective credits. Depending upon ability, students may complete the degree requirement by carrying additional credits in their four-year program or by enrolling for an extra semester or equivalent summer session.

FORESTRY CURRICULA

Management Concentration[1]

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BS 100 General Biology	4	CH 101 Gen. Chemistry I	4
CFR 134 Computers in Nat. Resources	1	ENG 112 Composition and Reading	3
ENG 111 Composition and Rhetoric	3	MA 114 Intro. Finite Math. Applic.[2]	3
FOR 110 Introduction to Forestry	2	WPS 202 Wood Struct. Prop. I	3
MA 121 Elements of Calculus[2]	4	Humanities/Social Science Elective[3,6]	3
PE 100 Health & Physical Fitness[5]	1	PE 253 Orienteering	1
	15		17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 103 General Chemistry II	4	BO 360 Introductory Ecology	3
EB 212 Econ. Agric. (Soc. Sci. Elec.)	3	BO 365 Ecology Lab	1
FOR 212 Dendrology	4	PY 212 College Physics II	4
PY 211 College Physics I	4	SSC 200 Soil Science	4
Physical Education Elective	1	ST 311 Intro. to Statistics	3
	16	Physical Education Elective	1
			16

SUMMER CAMP[7]

		Credits
FOR 204	Silviculture	2
FOR 261	Forest Communities	2
FOR 264	Forest Pest Mgmt.	1
FOR 265	Fire Management	1
FOR 274	Mapping and Mensuration	4
		10

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENT 301 Intro. For. Insects[8]	3	FOR 304 Silviculture	4
FOR 303 For. Tree Physiology	3	FOR 374 For. Inv. Gr. Yield	3
FOR 319 For. Economics	3	FOR 434 Mgmt. Dec. Mak. For. Wood Prod.	3
Advised Electives[4,6]	2	PP 318 Forestry Pathology[8]	4
Humanities/Social Science Electives	6	Humanities/Social Science Elective	3
	17	Free Elective[5,6]	3
			17

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
FOR 353 Air Photo Int.	3	FOR 406 For. Inv., Anly. & Plan.	4
FOR 405 Forest Management	4	FOR 472 Renew. Res. Pol. & Mgmt.	4
Advised Electives	3	Advised Electives	3
Humanities/Social Science Elective	3	Free Electives	6
Elective[5,6]	3		17
	16		

Minimum Hours Required for Graduation ... 141

[1]All students entering the Forestry curriculum are required to take at least one Forestry course during each of their first three semesters and until the following four courses are passed: FOR 110, CFR 134, WPS 202, and FOR 212. Grades of D or lower not accepted in ENG 112, FOR 274, 303, 304, 319, 374, 405, 406.
[2]Students with appropriate math skills are encouraged to take the math sequence MA 141-241-242 or MA 131-231.
[3]Fifteen credits of humanities/social science electives must come from approved list and include at least 6 credits of humanities and 3 credits of social science.
[4]Eight credits of advised electives require approval of student's advisor.
[5]Nine credits of free electives are chosen without restriction.
[6]Student may change sequence of electives, if desired.
[7]To be eligible for summer camp, the student must (1) have made a C or better in ENG 111 and 112, (2) have passed BS 100 and MA 114 (or MA 242 or MA 231), and (3) have no more than one D in FOR 110 and 212.
[8]These courses may be scheduled in senior year if necessary to schedule desired electives.
[9]PE 253 Orienteering must be taken in fall of the freshman or sophomore years.

Science Concentration[1]

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BS 100 Gen. Biology	4	CH 101 General Chemistry I	4
CFR 134 Computers in Nat. Resources	1	EB 201 Econ. I *or*	
ENG 111 Composition & Rhetoric	3	EB 212 Econ. Agri. (Soc. Sci. Elec.)	3
FOR 110 Introduction to Forestry	2	ENG 112 Composition & Reading	3
MA 141 Anly. Geometry & Calc. I	4	MA 241 Anly. Geometry & Calc. II	4
PE 100 Health & Physical Fitness[8]	1	WPS 202 Wood Struct. Prop. I	3
Hm./Soc. Sci. Elective[2,4]	3	PE 253 Orienteering	1
	17		18

SOPHOMORE YEAR

Fall Semester	*Credits*
CH 107 Prin. of Chemistry	4
FOR 212 Dendrology	4
MA 242 Anly. Geometry & Calc. III	4
PY 205 Physics for Engr. & Sci. I	4
Physical Education Elective[8]	1
	17

Spring Semester	*Credits*
BO 360 Intro. Ecology	3
BO 365 Ecology Lab.	1
PY 208 Physics for Engr. & Sci. II	4
SSC 200 Soil Science	4
ST 311 Intro. Statistics	3
Physical Education Elective	1
	16

SUMMER CAMP[6]

		Credits
FOR 204	Silviculture	2
FOR 261	Forest Communities	2
FOR 264	Forest Pest Mgmt.	1
FOR 265	Fire Management	1
FOR 274	Mapping and Mensuration	4
		10

JUNIOR YEAR

Fall Semester	*Credits*
ENT 301 Intro. For. Insects[7]	3
FOR 303 For. Tree Physiology	3
FOR 319 For. Economics	3
Humanities/Social Science Electives[2,4]	6
	15

Spring Semester	*Credits*
FOR 304 Silviculture	4
FOR 374 For. Inv. Gr. Yield	3
PP 318 For. Pathology[7]	4
Advised Elective[3,4]	3
Humanities/Social Science Electives	3
	17

SENIOR YEAR

Fall Semester	*Credits*
FOR 405 Forest Management	4
Advised Electives	6
Humanities/Social Science Electives	3
Free Electives [4,5]	3
	16

Spring Semester	*Credits*
FOR 472 Renew. Res. Pol. & Man.	4
Advised Electives	7
Free Electives	6
	17

Minimum Hours Required for Graduation ... 141

[1]All students entering the Forestry curriculum are required to take at least one Forestry course during each of their first three semesters and until the following three courses are passed: FOR 110, CFR 134, WPS 202, and FOR 212. Grades of D or lower not accepted in ENG 112, FOR 274, 303, 304, 319, 374, 405, 406.

[2]Fifteen credits of humanities/social science electives must come from approved list and include at least 6 credits of humanities and 3 credits of social science.

[3]Thirteen credits of technical electives are supporting courses chosen with approval of advisor. Freshmen who elect this curriculum shall be encouraged to develop a tentative program for use of electives. All students who elect this curriculum are *required* to develop a program for use of electives prior to preregistration for fall semester, junior year.

[4]Students may change sequence of electives, if desired.

[5]Nine credits of free electives are chosen without restriction.

[6]To be eligible for summer camp, the student must (1) have made a C or better in ENG 111 and 112, (2) have passed BS 100 and MA 114 (or MA 242 or MA 231), and (3) have no more than one D in FOR 110 and 212.

[7]These courses may be scheduled in senior year if necessary to schedule desired electives.

[8]PE 253 Orienteering must be taken in the fall of the freshman or sophomore year.

FORESTRY CURRICULA FOR TRANSFER STUDENTS

Students may transfer into one of the forestry concentrations after completing one or two years of study at another institution or in a different curriculum at NCSU. There are no minimum course or credit hour requirements which students must meet to transfer into the forestry program prior to summer camp. Transfer students follow one of three options:

(1) Students who wish to enter a forestry curriculum at summer camp and complete a two year transfer program (summer camp plus 4 regular semesters) must meet the transfer credit requirements as outlined in the two year transfer curricula.

(2) Students with less than 66 transfer credits (minimum of 55 but including 6 credits of English and the majority of the mathematics and science requirements) may be admitted for entry directly to summer camp. However, they should recognize that completion of the desired curriculum may require more than two years.

(3) Students with less than 55 transfer credits will be enrolled at the point in the curriculum appropriate to the type and number of credits already completed. Time required for completion of the desired curriculum will depend on the number of

transfer credits accepted and the number and sequence of courses needed to complete the curriculum.

Students who enroll at another institution with the intent of later transferring to a forestry curriculum at NCSU should take a program of courses that approximates as closely as possible the freshman and sophomore years of the desired forestry curriculum.

TRANSFER CURRICULUM, MANAGEMENT CONCENTRATION[1]

Transfer Credits[2]

Subject	*Credits*
Biology	4
Chemistry	8
English	6
Introductory Economics	3
Mathematics	7
Physics	8
Physical Education	4
Electives (Human. & Soc. Sci., free)	at least 26
	Total 66

If available, it is highly desirable that students substitute Ecology for an elective and a basic course in Statistics for an elective. Other desirable courses include Dendrology and Soil Science.

Course Sequence at NCSU

Summer Camp[3]		*Credits*
FOR 204	Silviculture	2
FOR 261	Forest Communities	2
FOR 264	Forest Pest Mgmt.	1
FOR 265	Fire Management	1
FOR 274	Mapping and Mensuration	4
		10

JUNIOR YEAR

Fall Semester		*Credits*	*Spring Semester*		*Credit*
CFR 134	Comp. in Nat. Res.	1	BO 360	Intro. Ecology	3
FOR 212	Dendrology	4	BO 365	Ecology Lab.	1
FOR 303	For. Tree Physiology	3	FOR 304	Silviculture	4
FOR 319	For. Economics	3	FOR 374	For. Inv. Gr. Yield	3
SSC 200	Soil Science	4	FOR 434	Mgmt. Dec. Mak. For. Wood Prod.	3
ST 311	Intro. Statistics	3	WPS 202	Wood Struct. Prop. I	3
		18			17

SENIOR YEAR

Fall Semester		*Credits*	*Spring Semester*		*Credits*
ENT 301	Intro. For. Insects	3	FOR 406	For. Inv. Anly. & Plan.	4
FOR 353	Air Photo Int.	3	FOR 472	Renew. Res. Pol. & Man.	4
FOR 405	For. Management	4	PP 318	For. Pathology	4
Advised Elective[4]		5	Advised Elective		3
		15	Minimum Hours Required for Graduation		141
					15

[1]Grades of D or lower not accepted in ENG 112, FOR 274, 303, 304, 319, 374, 405, 406.

[2]To receive transfer credit, courses must be equivalent in content to the required courses at NCSU.

[3]For entry into the Forestry curriculum at summer camp, transfer students must have a minimum of 55 transfer credits including 6 credits of English and the majority of the mathematics and science requirements.

[4]Eight credits of advised electives require approval of student's advisor.

TRANSFER CURRICULUM, SCIENCE CONCENTRATION[1]

Transfer Credits[2]

Subject	*Credits*
Biology	4
Chemistry	8
English	6
Introductory Economics	3
Mathematics	12
Physics	8
Physical Education	4
Electives (Human./Soc. Sci., free)	at least 20
Total	65

If available, it is highly desirable that students substitute Ecology and a basic course in Statistics for an elective. Other desirable courses include Dendrology and Soil Science.

Course Sequence at NCSU[3]

Summer Camp		*Credits*
FOR 204	Silviculture	2
FOR 261	Forest Communities	2
FOR 264	Forest Pests	1
FOR 265	Fire Management	1
FOR 274	Mapping & Mensuration	4
		10

JUNIOR YEAR

Fall Semester		*Credits*	*Spring Semester*		*Credits*
CFR 134	Comp. in Nat. Res.	1	BO 360	Intro. Ecology	3
FOR 212	Dendrology	4	BO 365	Ecology Lab	1
FOR 303	For. Tree Phys.	3	FOR 304	Silviculture	4
FOR 319	For. Economics	3	FOR 374	For. Inv. Gr. Yield	3
SSC 200	Soil Science	4	Advised Elective[5,6]		2
ST 311	Intro. Statistics	3	Free Elective[4,6]		3
		18			16

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENT 301 Intro. For. Insects	3	FOR 472 Renew. Res. Pol. Man.	4
FOR 405 For. Management	4	PP 318 Forestry Pathology	4
Advised Electives	5	WPS 202 Wood Struct. Prop. I	3
Free Elective	3	Advised Electives	6
	15		17

Minimum Hours for Graduation 141

[1]D grades not accepted in ENG 112, FOR 274, 303, 304, 319, 374, 405, 406.
[2]To receive transfer credit, courses must be equivalent in content to the required course at NCSU.
[3]For entry into the Forestry curriculum at summer camp, transfer students must have a minimum of 55 transfer credits including 6 credits of English and the majority of the mathematics and science requirements.
[4]Free electives are chosen without restriction.
[5]Thirteen credits of advised electives require approval of student's advisor.
[6]Student may change sequence of electives, if desired.

MINOR IN FOREST MANAGEMENT

The Department of Forestry offers an 18 credit hour minor in Forest Management that is open to all baccalaureate degree students at North Carolina State University. The objectives of the program are to provide fundamental knowledge of forest management to students who will pursue careers in related areas of natural resource management and to provide interested NCSU students an appreciation for the value of forest resources and the need for sound management of those resources.

The minor in Forest Management includes two different options, each requiring 18 credit hours. There are no prerequisites for entry into either option. Option 1 is for the student who wishes a basic overview of forestry. Option 2 is for students who wish instruction and field experience in forestry technical skills and requires that the student attend

forestry summer camp. For these students, forestry summer camp may be attended after either the sophomore or junior years. To be eligible for summer camp, the student must (1) have made a C or better in ENG 111 and 112, and (2) have passed BS 100, MA 114 (or MA 212 or MA 242), and FOR 212.

To enroll, students should contact the College of Forest Resources Office of Student Affairs.

Option 1

FOR 212—Dendrology (4 hours)
FOR 252—Introduction to Forest Science (3 hours)
(not open to Forestry majors)
FOR 352—Forest Measurements and Management (4 hours)
(not open to Forestry majors)
FOR 472—Renewable Resource Policy and Management (4 hours)
At least one additional 300 or 400 level forestry course (3-4 hours)

Option 2

FOR 212—Dendrology (4 hours)
Forestry Summer Camp (10 hours)
FOR 204—Silviculture
FOR 261—Forest Communities
FOR 264—Forest Pest Management
FOR 265—Fire Management
FOR 274—Mapping and Mensuration
FOR 472—Renewable Resource Policy and Management (4 hours)

PARKS, RECREATION AND TOURISM MANAGEMENT

Biltmore Hall (Room 4008)

Professor P. S. Rea, *Head of the Department*

Professors: H. A. Devine, C. D. Siderelis, R. E. Sternloff, M. R. Warren, J. D. Wellman, ; *Professors Emeriti:* T. I. Hines, W. E. Smith; *Associate Professors:* S. L. Kirsch, L. D. Gustke, C. S. Love, B. E. Wilson; *Associate Professors Emeriti:* G. A. Hammon, L. L. Miller, C. C. Stott; *Adjunct Associate Professor:* H. K. Cordell; *Assistant Professor:* G. L. Brothers; *Visiting Assistant Professor:* C. A. Cole; *Instructor:* S. R. Harper; *Adjunct Instructors:* J. I. Connors, W. C. Singletary, Jr., G. R. Worls; *Research Assistants:* L. W. Baggs, J. M. McManus, S. Payne; *Associate Members of the Faculty:* A. Attarian (Physical Education), C. E. Chesney (Agricultural Extension Service), L. H. Harkins (Extension Forest Resources), A. Lumpkin (Physical Education), J. D. Murray (UNC-Sea Grant), C. S. Vick (Agricultural Extension Service).

The department offers an interdisciplinary program combining elements of natural resource management with a concern for human services. Standards adopted by the recreation profession make college graduation a requirement for employment. North Carolina State University has facilities, staff, curriculum, program and an established reputation for comprehensive professional education in the study of parks, recreation and tourism management. The program is nationally accredited.

OPPORTUNITIES

As increased discretionary time becomes available for large segments of the American population, opportunities for growth in the leisure service professions have increased dramatically. A recreation and park professional's goal is to influence people to use their discretionary time wisely and to improve the quality of their lives. This goal is accomplished by providing recreation programs and facilities for people in a variety of settings.

Career opportunities include employment by park and recreation departments operated by county and municipal governments; employment by state agencies such as state parks, forests, and planning and advisory groups; and the federal government with agencies such as the National Park Service, Corps of Engineers, U. S. Forest Service, and military establishments.

Other major employers include youth and family service organizations such as the YMCA, YWCA, Boys Clubs, Boy and Girl Scouts. Industries employ recreation directors to head employee recreation programs. Recreation professionals are employed by schools as community school coordinators. Areas with perhaps the greatest growth potential for employment are tourism agencies and commercial recreation establishments such as resorts, private clubs, theme parks, and convention and conference centers.

CURRICULUM IN PARKS, RECREATION AND TOURISM MANAGEMENT

The curriculum in parks, recreation and tourism management offers a broad general education background, basic professional and technical courses, and the opportunity to specialize in a particular field. General education courses are in biology, psychology, sociology, political science, English, mathematics, physical sciences, and economics. Specialized courses are required in statistics and the use of computers.

The curriculum is designed to prepare men and women for a variety of positions in a young, dynamic and challenging profession. The focus of the curriculum is on management rather than face-to-face leadership. The curriculum provides 44 hours of professional course work that includes recreation philosophy, management techniques and skills, fiscal management, supervision, facility and site planning, programming, administration, and analysis and evaluation. A computer laboratory is utilized in many courses to provide the student with the best current technology available.

In addition to the general education requirements and the core professional requirements, students can begin to attain specialized training through 18 hours of concentration courses. At the beginning of the students' junior year they choose one of the following concentrations: tourism and commercial recreation, park management, natural resource management, or program management (including special emphasis in sports or arts management).

Academic studies on campus are supplemented by practical laboratory experiences in the Raleigh area, out-of-state field trips and study opportunities, and a ten-week internship with a park, recreation or tourism agency. Cooperative work-study programs are available.

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BO 200 Plant Life *or*		COM (SP) 110 Public Speaking *or*	
ZO 201 Animal Life	4	COM (SP) 112 Basic Prin. of Int. Comm.	3
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
MA 121 Introduction to Calculus *or*		RRA 152 Introduction to Recreation	3
MA 105 Mathematics of Finance *or*		CH *or* PY Elective	4-5
MA 114 Intro. to Finite Math Appl.	3-4	Humanities/Soc. Sci. Elective	3
PE 100 Health & Physical Fitness	1	Physical Education Elective	1
RRA 101 Rec. Res. Orientation Lab	1		17-18
Free Elective	3		
	15-16		

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
EB 201 Economics I *or*		SOC 301 Human Behavior *or*	
EB 212 Economics of Agri.	3	PSY 376 Human Growth & Dev.	3
RRA 215 Park & Rec. Maint. Mgmt.	3	RRA 216 Mging. Park & Rec. Facil.	3
SOC 202 Principles of Sociology *or*		ST 311 Introduction to Statistics	3
PSY 200 Intro. to Psychology	3	Concentration[1]	3
Computer Elective	3	Fine Arts Elective	3
English Writing Elective	3	Physical Education Elective	1
Physical Education Elective	1		16
	16		

JUNIOR YEAR

Fall Semester	*Credits*
RRA 350 Outdoor Recreation Management	3
RRA 358 The Recreation Program	4
Concentration[1]	6
Environ. Ethics Elective	3
	16

Spring Semester	*Credits*
BO (ZO) 360 and 365 Intro. to Ecology	4
RRA 359 Leadership Supervision in Rec.	3
RRA 451 Facility & Site Planning	3
Concentration[1]	3
Free Elective	3
	16

SUMMER SESSION
(9 weeks)

	Credits
RRA 475 Recreation and Park Internship	8

SENIOR YEAR

Fall Semester	*Credits*
RRA 438 Recreation for Special Pop.	3
RRA 453 Admin. Proc. of Park & Rec. Org.	3
RRA 476 Post Intern Seminar	1
Concentration[1]	3
Fine Arts Elective	3
Free Elective	3
	16

Spring Semester	*Credits*
RRA 454 Recreation & Park Finance	3
RRA 480 Rec. Analysis Evaluation	3
Concentration[1]	6
Free Elective	3
	15

Minimum Hours Required for Graduation ... 135

[1]Of the 18 hours in the various concentration areas, 9 to 12 hours are required specifically for the selected concentration and 9 to 15 hours are elected from controlled areas.

MINOR IN PARKS, RECREATION AND TOURISM MANAGEMENT

The academic minor in Parks, Recreation and Tourism Management, is offered to students interested in gaining a basic knowledge of the parks, recreation and tourism field and an understanding of the importance of leisure and recreation in American society. It is not intended to prepare students for a professional career in parks, recreation and tourism. Seven hours of required courses and nine hours of electives are necessary to complete the minor. The program provides a background in recreation and park management which is useful to students who will 1) assume full-time careers that are associated with recreation and park services (in such fields as landscape architecture, public administration, and forestry) and 2) become involved in the park and recreation field as a volunteer, program leader or policy making board member with such organizations as the Scouts, Y's, art advisory councils, and conservation organizations.

WOOD AND PAPER SCIENCE

Biltmore Hall (Room 1022)

Professor R. J. Thomas, *Head of the Department*

Alumni Distinguished Undergraduate Professor: M. W. Kelly

Alumni Distinguished Graduate Professor and Elis & Signe Olsson Professor: J. S. Gratzl

Reuben B. Robertson Professor: H-M Chong

Professors: H-M. Chang, E. B. Cowling, E. L. Deal, I. S. Goldstein, J. S. Gratzl, C. A. Hart, T. W. Joyce, M. W. Kelly, H. G. Olf, R. G. Pearson, E. A. Wheeler; *Professor Emeriti:* A. C. Barefoot, E. L. Ellwood, R. G. Hitchings; *Adjunct Professors:* L. L. Edwards, T. K. Kirk, S. Y. Lin, T. O. Norris, R. P. Singh; *Associate Professors:* R. C. Gilmore, S. J. Hanover, J. A. Heitmann, Jr., L. G. Jahn, H. Jameel; *Adjunct Associate Professor:* R. B. Phillips; *Associate Professors Emeriti:* L. H. Hobbs, C. G. Landes, C. N. Rogers; *Adjunct Assistant Professor:* A. G. Raymond, Jr.; *Instructor:* A. G. Kirkman;

Research Associates: C-L. Chen, E. Jerger, N. C. Weidhaas; *Research Assistants:* W. S. Bryan, M. V. Byrd; *Associate Member of the Faculty:* J. P. Roise (Forestry).

The wood-based industry of North Carolina, as well as throughout the South, is a vital part of the nation's economy. In terms of the dollar value of shipments of wood products, the South leads all regions of the country. North Carolina manufactures more wood household furniture than any other state, ranks third in shipment value for all wood-based products and second in number of employees and wages paid. Thus, many opportunities exist in North Carolina and other southern states for careers in the wood-based industry.

The Department of Wood and Paper Science offers two curricula leading to Bachelor of Science degrees—(1) Pulp and Paper Science and Technology, and (2) Wood Products. Both curricula prepare young men and women for careers in the wood-based and allied industries or in government agencies connected with wood resources.

PULP AND PAPER SCIENCE AND TECHNOLOGY

Professor R. J. Thomas, *In Charge*

The Pulp and Paper Science and Technology curriculum prepares students for careers in pulp and paper, an industry that ranks as the fifth largest manufacturing industry in the United States. Science, engineering, and mathematics form the basis for a multidisciplinary approach to understanding the fundamental manufacturing principles involved. Students study wood pulping processes, chemical and by-product recovery systems, and pulp bleaching. In addition, various paper-making operations such as refining, sizing, coating, and drying are studied.

Three concentrations are available emphasizing the technological or engineering aspects of pulping and papermaking. The Technology Concentration provides a broad background for those students anticipating careers in mill operations or with paper industry supplier organizations. Greater depth in the underlying engineering principles or their applications can be obtained from the Science Concentration or the Chemical Engineering Concentration, either of which provides a good foundation for graduate study. Students who have completed the Chemical Engineering Concentration in pulp and paper science and technology can, in cooperation with the College of Engineering and with an additional semester of study, earn a Bachelor of Science in Chemical Engineering as a second degree.

OPPORTUNITIES

Graduates of this curriculum find opportunities for challenging careers as process engineers, product development engineers, process control chemists, technical service engineers, quality control supervisors, and production supervisors. Design and construction engineering companies employ graduates as project engineers, and pulp and paper machinery companies use their education and skills for technical service and sales positions. Opportunities for managerial and executive positions are available to graduates as they gain experience.

SUMMER INTERNSHIP

All pulp and paper majors are required to work one summer in a pulp or paper mill. One hour of academic credit is granted after completion of 12 weeks of mill work and presentation of a satisfactory report. In addition, students are urged to work in mills the other two summers, as the work provides valuable practical experience. Departmental advisors assist students in locating summer work.

REGIONAL PROGRAM

The pulp and paper curriculum is a regional program approved by the Southern Regional Education Board as the undergraduate program to serve the Southeast in this field.

SCHOLARSHIPS

Approximately 80 undergraduate academic scholarships are granted annually to new and continuing students by more than 100 companies comprising the Pulp and Paper Foundation.

TECHNOLOGY CONCENTRATION
PULP AND PAPER SCIENCE AND TECHNOLOGY CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 107 Principles of Chemistry	4
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
MA 141 Analytic Geometry & Calc. I	4	GC 101 Engineering Graphics I	2
PE 100 Health & Physical Fitness	1	MA 241 Analytic Geometry & Calc. II	4
WPS 101 Intro. to Wood and Paper Science	1	WPS 102 Intro. Pulp Paper Sci. & Tech.	1
Humanities/Social Science Elective[2]	3	Humanities/Social Science Elective[2]	3
	16	Physical Education Elective	1
			18

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 221 Organic Chemistry I	4	CH 223 Organic Chemistry II	4
MA 242 Analytic Geometry & Calc. III	4	CHE 205 Chemical Process Princ.	4
PY 205 General Physics	4	PY 208 General Physics	4
Humanities/Social Science Elective[2]	3	WPS 242 Wood Fiber Analysis	2
Physical Education Elective	1	Humanities/Social Science Elective[1]	3
	16	Physical Education Elective	1
			18

SUMMER SESSION

	Credits
WPS 211 Pulp and Paper Internship	1

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 315 Quantitative Analysis	4	ENG 331 Communication for Engineering and Technology	3
CH 331 Intro. Physical Chemistry	4	WPS 322 Pulp & Paper Technology II	3
WPS 321 Pulp & Paper Technology I	3	WPS 332 Wood and Pulping Chemistry	4
Humanities/Social Science Elective[2]	3	WPS 355 Pulp & Paper Unit Proc. I	3
Technical Elective	3	Free Elective	3
	17		16

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
WPS 360 Pulp & Paper Unit Processes II	3	WPS 403 Paper Process Analysis	3
WPS 413 Paper Properties & Additives	4	WPS 410 Systems Analysis & Ctrl.	3
WPS 415 Proj. Mgt. & Control I	2	WPS 416 Proj. Mgmt. & Control II	2
WPS 471 Pulping Process Analysis	3	Humanities/Social Science Elective[2]	3
Technical Elective	3	Technical Elective	1
Free Elective	3	Free Elective	3
	18		15

Minimum Hours Required for Graduation ... 135

[1]Basic economics course recommended.
[2]See approved list: 6 hours each must be taken in both humanities and social science courses. The remaining 6 hours may be taken in either humanities or social science.

SCIENCE CONCENTRATION
PULP AND PAPER SCIENCE AND TECHNOLOGY CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 107 Principles of Chemistry	4
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
MA 141 Analytic Geometry & Calculus I	4	GC 101 Engineering Graphics I	2
PE 100 Health & Physical Fitness	1	MA 241 Analytic Geometry & Calculus II	4
WPS 101 Intro. to Wood and Paper Science	1	WPS 102 Intro. to Wood & Paper Science	1
Humanities/Social Science Elective[1]	3	Free Elective	3
	16	Physical Education Elective	1
			18

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 221 Organic Chemistry I	4	CH 223 Organic Chemistry II	4
MA 242 Analytic Geometry & Calculus III	4	MA 301 Applied Diff. Equations I	3
PY 205 General Physics	4	PY 208 General Physics	4
Humanities/Social Science Elective[2]	3	WPS 242 Wood Fiber Analysis	2
Physical Education Elective	1	Humanities/Social Science Elective[2]	3
	16	Physical Education Elective	1
			17

SUMMER SESSION

	Credits
WPS 211 Pulp and Paper Internship	1

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 315 Quantitative Analysis	4	CH 433 Physical Chemistry II	3
CH 431 Physical Chemistry I	3	ENG 331 Communication for Engineering and Technology	3
ST 361 Intro. to Statistics for Engineers	3	WPS 322 Pulp and Paper Technology II	3
WPS 321 Pulp and Paper Technology I	3	WPS 332 Wood & Pulping Chemistry	4
Free Elective	3	Technical Electives	3
	16		16

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
WPS 413 Paper Prop. and Additives	4	WPS 403 Paper Process Analysis	3
WPS 471 Pulping Process Analysis	3	Humanities/Social Science Elective[2]	3
Humanities/Social Science Elective[2]	3	Technical Electives	7
Technical Electives	6	Free Elective	3
	19		16

Minimum Hours Required for Graduation ... 135

[1]Basic economics course recommended.
[2]See approved list: 6 hours each must be taken in humanities and in social science courses. The remaining 6 hours may be taken in either humanities or social science.

CHEMICAL ENGINEERING CONCENTRATION
PULP AND PAPER SCIENCE AND TECHNOLOGY CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 107 Principles of Chemistry	4
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
MA 141 Analytic Geometry & Calc. I	4	GC 101 Engineering Graphics I	2
PE 100 Health & Physical Fitness	1	MA 241 Analytic Geometry & Calc. II	4
WPS 101 Intro. to Wood and Paper Sci.	1	WPS 102 Intro. to Pulp Paper Sci. & Tech.	1
Humanities/Social Science Elective[1]	3	Physical Education Elective	1
	16		15

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 221 Organic Chemistry I	4	CH 223 Organic Chemistry II	4
CHE 205 Chemical Process Principles	4	CHE 225 Chemical Process Systems	3
MA 242 Analytic Geometry & Calc. III	4	MA 301 Applied Diff. Equations I	3
PY 205 General Physics	4	PY 208 General Physics	4
Physical Education Elective	1	WPS 242 Wood Fiber Analysis	2
	17	Physical Education Elective	1
			17

SUMMER

	Credits
WPS 211 Pulp and Paper Internship	1

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CHE 311 Transport Processes I	3	CH 437 Physical Chemistry for Engineers	3
CHE 315 Chem. Proc. Thermodynamics	3	CHE 312 Transport Processes II	3
MAT 201 Struct. & Prop. of Engr. Matr'ls.	3	CHE 316 Thermo. Chemical & Phase Equilibria	3
WPS 321 Pulp & Paper Technology I	3	WPS 322 Pulp & Paper Technology II	3
Humanities/Soc. Sci. Electives	6	WPS 332 Wood and Pulping Chemistry	4
	18		16

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CHE 330 Chemical Engineering Lab I	2	ECE 331 Prin. of Electrical Engr. *or*	
WPS 360 Pulp & Paper Unit Processes II	3	CHE 425 Proc. System Analysis & Ctrl.	3
WPS 413 Paper Properties & Additives	4	WPS 403 Paper Process Analysis	3
WPS 415 Proj. Mgmt. & Control I	2	WPS 410 System Analysis & Control	3
WPS 471 Pulping Process Analysis	3	WPS 416 Proj. Mgmt. & Control II	2
Humanities/Social Science Elective[1]	3	Humanities/Social Science Elective[1]	3
	17	Technical Elective	1
			18

Minimum Hours Required for Graduation ... 135

[1]See approved list: 6 hours must be taken from humanities, 6 hours must be taken from social science and the remaining 6 hours may be taken from either humanities or social science.

Note: To complete the requirements for a B.S. in CHE students will need CHE 421, CHE 425 and CHE 446.

WOOD SCIENCE AND TECHNOLOGY

Professor M. W. Kelly, *In Charge*

The wood products industry is of major importance to the economy of North Carolina and the Southeast. It ranks third in the state in the value of shipments, behind only textiles and tobacco products, and it is second to textiles in the number of employees. The managerial opportunities for graduates with a B.S. in Wood Products are excellent. Graduates of this program have a broad education in the humanities, communication skills, social and natural sciences, as well as the professional training required for managerial positions in the wood products industry. The curriculum is similar to a material science program, based on the natural resource wood, with an emphasis on industrial manufacturing and management. Graduates have a thorough knowledge of wood as a raw material that enables them to properly design and process wood into a variety of products of value to society. As nonrenewable resources diminish and their cost of procurement increases, the demand for wood, a renewable resource, increases. Currently, career opportunities are excellent and continued demand for individuals with a wood products education is anticipated.

OPPORTUNITIES

The Wood Products curriculum at North Carolina State University, which is accredited by the Society of Wood Science and Technology, prepares graduates for production super-

vision, staff positions and management responsibilities in all types and sizes of wood industries. Careers also include industrial positions with both large and small companies manufacturing consumer wood products such as furniture. Graduates are also in demand by suppliers to wood manufacturing industries such as chemical and machinery companies. Opportunities are also available with state and federal government in research, marketing, or extension activities.

SCHOLARSHIPS

Approximately ten undergraduate academic scholarships are granted annually to new and continuing students through the Forestry Foundation.

TECHNICAL ELECTIVES

The curriculum provides a minimum of 15 credit hours for technical electives which may be used to pursue a minor in a variety of areas including business management, industrial engineering, forestry management or economics. For those undergraduates desiring exposure to more than one area, the technical electives may be chosen from these areas and from others, *e.g.*, furniture manufacturing and management, and graphic communication.

DUAL DEGREE PROGRAMS

Dual degree programs are available whereby students can obtain, in addition to a Bachelor of Science in wood products, a second Bachelor of Science degree in forestry, pulp and paper science, furniture manufacturing and management, or business management. Credits beyond those required for the single degree program are necessary and minimum of an additional year of study is usually required. Individuals interested in a dual degree should contact the appropriate departmental office.

CURRICULUM IN WOOD PRODUCTS

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BS 100 General Biology *or*		CH 101 General Chemistry I	4
BO 200 Plant Life	4	ENG 112 Composition & Reading	3
ENG 111 Composition & Rhetoric	3	GC 101 Engineering Graphics I	2
MA 131 Analytic Geometry & Calc. A[1]	4	MA 231 Analytic Geometry & Calc. B[1]	3
PE 100 Health & Physical Fitness	1	WPS 202 Wood Struct. & Prop. I	3
WPS 101 Intro. to Wood & Paper Sci.	1	Physical Education Elective	1
Humanities/Soc. Sci. Elective[2]	3		16
	16		

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CFR 134 Computers in Forest Res.	1	EB 201 Economics I (Soc. Sci.)	3
CH 103 General Chemistry II	4	PY 212 General Physics II	4
PY 211 General Physics I	4	WPS 203 Wood Struct. & Prop. II	4
WPS 240 Wood Products	3	Humanities/Social Science Elective[2]	3
Humanities/Social Science Elective[2]	3	Free Elective	3
Physical Education Elective	1		17
	16		

SUMMER PRACTICUM

	Credits
WPS 205 Wood Products Practicum	5
WPS 210 Forest Products Internship	1
	6

JUNIOR YEAR

Fall Semester	*Credits*
ENG 331 Comm. Tech. Info.	3
ST 361 Statistics for Engineers	3
WPS 301 Wood Processing I	4
Humanities/Social Science Elective[2]	3
Technical Elective	3
Physical Education Elective	1
	17

Spring Semester	*Credits*
WPS 302 Wood Processing II	4
WPS 316 Wood-Polymer Prin.	4
WPS 344 Intro. to Quality Control	3
WPS 350 Wood Products Literature	2
Technical Electives	3
	16

SENIOR YEAR

Fall Semester	*Credits*
WPS 441 Wood Mechanics	4
WPS 482 Senior Topics in WPS	2
Humanities/Social Science Elective[2]	3
Technical Elective	3
Free Elective	3
	15

Spring Semester	*Credits*
WPS 434 Quan. Meth. of Dec. Mak. in Forest Products	3
WPS 444 Wood Composite	3
WPS 450 Wood Ind. Case Studies	2
Technical Electives	6
Free Elective	3
	17

Minimum Hours Required for Graduation ... 136

[1]Students with appropriate mathematical aptitude and interest are encouraged to substitute MA 141, MA 241 and MA 242 for the mathematical sequence listed.
[2]See approved list: 6 hours must be taken from Humanities and 3 hours must be taken from Social Science and remaining 6 hours may be taken from either Humanities or Social Science.

MINOR IN WOOD PRODUCTS

The Wood Products minor is available to all undergraduate students, except Wood Products majors, enrolled in the University as degree candidates. The minor requires 15 credit hours. Ten hours of required courses provide a general background in wood anatomy, physical properties, and wood-based composites. Five elective hours may be chosen from areas including wood processing, wood mechanics, quality control, and wood-polymer interactions.

The Wood Products minor, with its focus on wood properties and processing, is designed to be especially valuable to students majoring in programs leading to careers in areas such as structural design, furniture manufacturing, and forestry. Students interested in natural and renewable materials will also find the minor useful.

COLLEGE OF HUMANITIES AND SOCIAL SCIENCES

Caldwell Hall (Room 106)

W. B. Toole, III, *Dean*

M. M. Sawhney, *Associate Dean*

G. D. Garson, *Associate Dean for Planning and Management*

E. D. Sylla, *Associate Dean for Research and Graduate Programs*

W. C. Fitzgerald, *Assistant Dean for Undergraduate Affairs*

S. E. Simonsen, *Assistant to the Dean for International Studies*

J. N. Wall, *Director of Honors/Scholars Programs*

D. B. Greene, *Coordinator of Arts Studies*

L. H. Hambourger, *Coordinator of Evening Programs and Assistant to the Dean*

J. S. Griffin, *Academic Coordinator for African-American Students*

The College of Humanities and Social Sciences offers programs of study which lead to baccalaureate and advanced degrees in the disciplines comprising the humanities and social sciences, and also offers courses in these areas which are part of the programs of all undergraduate students in the university. In this way the university provides an opportunity for its students to prepare for a full life in professions and occupations that require intellectual flexibility, broad knowledge, and a basic comprehension of human beings and their problems.

Ten departments are included in the College of Humanities and Social Sciences: Accounting, Economics and Business (both of the Division of Economics and Business); Communication; English; Foreign Languages and Literatures; History; Philosophy and Religion; Physical Education; Political Science and Public Administration; and Sociology, Anthropology and Social Work (also a department in the College of Agriculture and Life Sciences). The Division of Multidisciplinary Studies, an academic unit responsible for interdisciplinary programs, is also affiliated with this college. Undergraduate majors are offered in economics, accounting, business management, communication, English, history, French, Spanish, philosophy, political science, sociology, social work, and multidisciplinary studies. In some departments special concentrations are available within the major programs: e.g., writing and editing (English), law and political philosophy (political science or philosophy), anthropology (sociology), religious studies (philosophy), criminal justice (political science or sociology) and international studies (any HSS major). A teacher education option is available in English, French, Spanish, and social studies (history, political science, sociology). Enrollments in teacher education programs may be limited. Degrees granted include the Bachelor of Arts, the Bachelor of Science, the Bachelor of Social Work, the Master of Arts, and the Doctor of Philosophy, as well as professional degrees in economics, political science, and sociology.

BACHELOR OF ARTS PROGRAM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
PE 100 Health & Physical Fitness	1	History	3
History[1]	3	Mathematics	3-4
Mathematics[2]	3-4	Philosophy[5]	3
Foreign Language 201 (Intermediate)[3]	3	Social Science	3
Social Science[4]	3	Physical Education	1
	16-17		16-17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Literature[6]	3	Literature	3
Natural Science[7]	3-4	Natural Science	3-4
Social Science	3	Social Science	3
Electives	6	Elective	3
Physical Education	1	Arts and Letters Elective[8]	3
	16-17	Physical Education	1
			16-17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Major[9]	9	Major	9
Electives	6	Electives	6
	15		15

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Major	9	Major	6
Electives	6	Electives	9
	15		15

Minimum Hours Required for Graduation ... 124

[1] This two-semester requirement includes a course concerned with pre-industrial Western or non-Western societies (HI 207, 208, 209, 215, 216, 263, 264, 275, or 276), and another dealing with the United States or post-industrial Western societies (HI 205, 210, 221, 222, 233, 243, 244, 251, 252).

[2] Two semesters are required for economics and business or sociology majors (MA 121, 131, or 141 and 114 required for economics and business; MA 111 and 131 recommended for sociology but any two mathematics courses other than MA 101 allowed). For all other humanities and social science majors the requirement may be satisfied with any two mathematics courses other than MA 101 or one mathematics course other than MA 101 plus a course in computer science, statistics, or logic.

[3] Demonstrated proficiency at the first-semester intermediate level (FL 201 in French, Spanish, German, Russian, Portuguese, Italian, Latin, Classical Greek, Biblical Hebrew, Japanese, Chinese, or Swahili. In order to enroll at the 201 level, prerequisites must be met through course work or the Placement Test. Demonstrated proficiency at the second-semester intermediate level (FL 202) in one language is required for English and foreign language majors.

[4] The requirements call for twelve hours of social science representing at least three of the following disciplines: anthropology, economics, political science, psychology, sociology. At least nine of these hours must be outside the student's major field.

[5] Three hours of philosophy, exclusive of logic (PHI 201 and 335), are required.

[6] This requirement may be satisfied with (1) any two of the following survey courses: ENG 261, ENG 262, ENG 265, ENG 266, FLG 316, FLG 323, FLF 301, FLF 302, FLS 301, FLS 302, FLS 304; (2) with ENG 251-252; (3) with ENG 251 plus any course listed in (1) except ENG 261-262; or (4) with ENG 252 plus any course listed in (1) except ENG 265-266.

[7] The natural science requirement calls for a minimum of eight credit hours. At least one course must include a laboratory experience. Students must receive credit for at least one basic introductory course from physics, chemistry, geology, or the biological sciences. These courses include CH 101, CH 103, CH 107, CH 111; PY 205, PY 208, PY 211, PY 212, PY 221, PY 223/225, and PY 231; MEA 101 with MEA 110; BS 100 or BS 105; BO 200. To complete the requirement, students may take any of the courses listed above, except that if BS 100 or BS 105 has been taken the other may not be taken for credit and that BO 200 may not be combined with either BS 100 or BS 105. Otherwise the requirement may be completed with any course in botany, chemistry (except CH 105), genetics, physics, zoology, or marine, earth, and atmospheric sciences (except MEA 120, 208, or 215), or with ENT 425.

[8] One of the following courses outside the student's major is required: COM (SP) 103, COM (SP) 213, COM (SP) 321, COM (SP) 411; DN 141, DN 142; ENG 346, ENG 347, ENG 390; FL 350; FLF 352; FLR 303, FLR 304; GRK 310, GRK 320; HA 201, HA 202, HA 203, HA 298, HA 401, HA 402, HA 404, HA 498; MUS 200, MUS 210, MUS 215, MUS 220, MUS 230, MUS 240, MUS 301, MUS 320; any religion course except Hebrew language courses. Also, FL 295, FL 298, FL 495 and FL 498 may be used in special circumstances to satisfy this requirement.

[9] Major requirements for the Bachelor of Arts range from 30-51 hours. Most of the major programs call for 30 hours of work above the basic courses in a discipline.

BACHELOR OF SCIENCE PROGRAM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 107 Principles of Chemistry *or*	
ENG 111 Composition & Rhetoric	3	CH 103 General Chemistry II	4
PE 100 Health & Physical Fitness	1	ENG 112 Composition & Reading	3
Humanities/Soc. Sci. Elective[2]	3	Mathematics	3-4
Mathematics[1]	4	Humanities/Soc. Sci. Elective	3
	15	Physical Education Elective	1
			14-15

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Course I-Major	3	Course II-Major	3
Eng Lit/Foreign Language[3]	3	Foreign Languages/English Literature	3
Mathematics	3-4	Humanities/Soc. Sci. Elective	3
PY 205 or 211 General Physics I	4	Mathematics	3
Philosophy[4]	3	PY 208 or 212 General Physics II	4
Physical Education Elective	1	Physical Education Elective	1
	17-18		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
BS 100 General Biology	4	ZO 201 General Zoology *or*	
Course I Option[5]	3	BO 200 Plant Life	4
Course III-Major	3	Course II-Option	3
History or Philosophy of Science[6]	3	Course IV-Major	3
Humanities/Soc. Sci. Elective	3	Course V-Major	3
	16	Elective	3
			16

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Course III-Option	3	Course V-Option	3
Course IV-Option	3	Course VIII-Major	3
Course VI-Major	3	Course IX-Major	3
Course VII-Major	3	Electives	6
Elective	3		15
	15		

Minimum Hours Required for Graduation 127

[1]Four courses are required, including either the sequence MA 141, 241, 242 or MA 131, 231. The remaining course(s) are to be chosen from MA 114, 214, 303, 341, and 405.
[2]Twelve hours in humanities and/or social sciences outside the major discipline are required.
[3]Six hours of foreign language and/or English literature at the 200 level or above are required.
[4]Any course in philosophy, excluding logic (PHI 201, 335) and philosophy of science (PHI 340).
[5]A 15 hour concentration is required in a mathematics, science, or engineering discipline.
[6]A course in the history or philosophy of science or mathematics to be chosen from a specified list of alternatives.

CONCENTRATION IN INTERNATIONAL STUDIES

In recognition of the increasing need to understand the complexities of an interdependent world, the College of Humanities and Social Sciences offers a concentration in International Studies to students interested in focusing upon international affairs. This concentration is offered in conjunction with a departmental major, the requirements of which must also be met by a student electing the concentration.

The concentration is designed to enhance the student's understanding of the contemporary world, its resources and its problems, thereby enabling the student to be a more effective participant in world affairs. It consists of three integrated Seminars in International Affairs, demonstrated competency in a modern foreign language, and a minimum of five courses focusing upon a particular geographical area of the world or upon a particular international issue or set of issues. Each student's program will be individually designed in consultation with the student's departmental advisor, subject to the approval of the Committee on International Studies, the Assistant to the Dean for International Studies, and the Dean of the College of Humanities and Social Sciences.

MINOR IN INTERNATIONAL STUDIES

The International Studies Minor is offered to all students in the University who want to add a significant international dimension to their departmental majors. This minor program enables students to explore international topics, issues and research from cross-cultural, transnational perspectives. The program will provide some tools that students can use to understand better the global context of the modern world and to learn the international dimensions of their chosen fields of study.

MINOR IN ARTS STUDIES

The College of Humanities and Social Sciences offers an academic minor in Arts Studies to all majors in the University. This interdisciplinary minor is designed to enrich the student's university experience, to serve as a foundation for learning and understanding in the arts beyond the university years, and to stimulate intellectual development in ways that may reinforce or complement the objectives of the student's major. This minor provides the student with a fundamental understanding of the historical, theoretical, and practical disciplines of the arts. A total of eighteen credit hours must be taken to complete this minor.

Students interested in the minor should refer to the Arts Studies courses listed in the front section of this catalog and consult with the Arts Studies Coordinator in the dean's office of the College of Humanities and Social Studies.

HONORS PROGRAM

Each of the degree-granting departments in the College of Humanities and Social Sciences has an honors program designed to encourage outstanding students to develop their intellectual potential to the fullest extent possible through individualized study, special seminars, and close association with faculty members in their major field. The college also, in conjunction with the Division of Student Affairs, sponsors a residential Scholars of the College Program for students who show exceptional academic promise. The participants take special sections of freshman and sophomore level courses and a series of cultural events and weekly forums before undertaking specialized honors work in their major. In their junior year they participate each semester in a special Junior Scholars Seminar and attend monthly forums.

SCHOLARSHIPS

In addition to the university-wide awards available, the following scholarships are offered to entering freshmen:

Nathaniel C. Browder Scholarship ($1000)
Bess B. and Lynton Yates Ballentine Scholarship ($1000)
American Defender Life Scholarship ($1000)
Humanities and Social Sciences Merit Scholarship ($1000)
Claire Simmons Allan-Sampson Memorial Scholarship in Moral Philosophy ($1000)
Thomas Jefferson Scholarship in Agriculture and the Humanities ($1000)
Benjamin Franklin Scholars Program (joint program with College of Engineering) ($1000-$2000 per year for four years)
Eli Whitney Double Degree Program in Textiles and International Studies ($1000-$2000 per year for four years)

For further information, write:

Dr. John Wall
Director, Honors/Scholars Programs
College of Humanities and Social Sciences
North Carolina State University
Box 8105
Raleigh, N. C. 27695-8105

PRE-LAW PROGRAM

Law schools neither prescribe nor recommend a particular undergraduate curriculum for prospective candidates. The Association of American Law Schools has, however, recommended an undergraduate education of the broadest possible scope as the best means of developing the communicative, critical, and creative skills and abilities fundamental to success in legal studies and practice. A student may prepare for post-graduate work in law in any of the majors offered by the ten degree-granting departments in the College of Humanities and Social Sciences. Alternatively, the student may elect the Concentration in Philosophy of Law (Department of Philosophy and Religion) or the Concentration in Law and Political Philosophy (Department of Political Science and Public Administration) or may apply for admission to Multidisciplinary Studies during the sophomore year and, in consultation with an advisor, design a pre-law major involving two or more academic areas.

All interested entering freshmen are invited to attend a special orientation session for pre-law students. These students are also invited to join the Pre-law Student Association, an undergraduate organization that provides pre-law students with information concerning preparation for the law school admission test (LSAT) as well as the study and practice of law through guest speakers, discussion sessions, and other activities. Consult Prof. Baumer, 737-2608, or Prof. Reid, 737-2481, for more information.

COOPERATIVE EDUCATION

Cooperative Education in Humanities and Social Sciences seeks to broaden the student's intellectual horizons and at the same time to provide an introduction to the world of business, industry, government, or finance in preparation for a career after graduation. In this program the freshman and senior years are usually spent on campus while the sophomore and junior years are devoted either to alternate periods of on-campus study and off-campus work or to a parallel arrangement of part-time work and part-time study on a continuous basis. The student is paid for work experiences by the employer. Ordinarily the program takes five years to complete, but those who are willing to attend summer school or take on a summer co-op assignment can finish in four years. Transfer students are eligible and all interested students are urged to apply early in the academic year. The program is also open to graduate students although less time is required on work assignment.

Further information may be obtained from D. G. Branch, Coordinator of Cooperative Education, 213 Peele Hall (737-2300).

JEFFERSON SCHOLARS IN AGRICULTURE AND THE HUMANITIES

(See also College of Agriculture and Life Sciences)

The Thomas Jefferson Scholars Program in Agriculture and the Humanities is a joint program of the College of Humanities and Social Sciences and the College of Agriculture and Life Sciences. It is a double degree program which permits participants to have two concentrations: one in an area of agriculture, such as agronomy, animal science, food science, or horticulture, and one in an area of humanities/social sciences, such as business management, public policy, international studies, or general humanities. The double degree program may be individually designed to meet each student's particular interests and career goals. The purpose of the program is to produce potential leaders in agriculture who have not only technical expertise but also an appreciation for the social, political, and cultural issues that effect decision-making.

Each spring a number of entering freshmen are chosen to receive scholarships to participate in the Jefferson program. In addition, other qualified students may choose to pursue a double major in agriculture and the humanities under the Jefferson program.

Students interested in applying to the Jefferson Scholars program should contact: Office of the Dean, College of Humanities and Social Sciences, Box 8101, North Carolina State University, Raleigh, NC 27695-8101, or the Office of the Associate Dean, College of Agriculture and Life Sciences, Box 7601, before January 15.

For more information, contact the program coordinator, Dr. Gerald Elkan (4521 Gardner Hall, 737-3945) or Lynda Hambourger, Assistant to the Dean, Humanities and Social Sciences (106 Caldwell Hall, 737-2467).

BENJAMIN FRANKLIN SCHOLARS PROGRAM

This double degree program, a joint undertaking of the College of Engineering and the College of Humanities and Social Sciences, provides a unique opportunity to integrate a solid base of knowledge in technology or science with the broad philosophical perspective of the humanities. In five years, students can earn both a B.S. in an engineering/computer science major and a B.A. in multidisciplinary studies. The curriculum for the double degree program, which calls for 171 semester hours, has four main components: (1) a strong general education, (2) especially designed interdisciplinary and problem defining courses, (3) all technical course requirements associated with the engineering degrees, and (4) a 30-hour multidisciplinary concentration (including a three-hour senior thesis) designed jointly by the student and his/her advisers.

Merit scholarship awards are available for high-achieving students who participate in the Franklin Scholars program. For more information, contact the Director of Academic Affairs, College of Engineering (118H Page Hall, 737-2315) or the Assistant Dean for Undergraduate Affairs, College of Humanities and Social Sciences (106 Caldwell Hall, 737-2467).

ELI WHITNEY DOUBLE DEGREE PROGRAM IN TEXTILES AND INTERNATIONAL STUDIES

This joint program between the College of Textiles and the College of Humanities and Social Sciences allows a student to earn a B.S. in textile and apparel management and a B.A. in multidisciplinary studies with a concentration in international studies. This dual degree is designed to prepare students for work in the increasingly international textile industry. The program includes all the technical course requirements associated with the textiles and apparel management degree. For the B.A. in multidisciplinary studies, students choose from among three areas of concentration: the Pacific Rim (language study in Japanese or Chinese), Latin American (language study in Spanish), or Europe (language study in German or Italian). The program, which takes four to five years to complete, also includes an overseas internship.

Merit scholarship awards are available for high-achieving students who participate in the double degree program in Textiles and international studies. For more information, contact Dr. Gordon Berkstresser, Textile Management and Techology (142 Nelson Hall, 737-3442) or the Assistant Dean for Undergraduate Affairs, College of Humanities and Social Science (106 Caldwell Hall, 737-2467).

FOLGER INSTITUTE

North Carolina State University is a member of the Folger Institute of Renaissance and Eighteenth-Century Studies, a unique collaborative enterprise sponsored by the Folger Shakespeare Library in Washington, D.C., and twenty universities in the Middle Atlantic region. Each year the institute offers an interdisciplinary program in the humanities—seminars, workshops, symposia, colloquia, and lectures. Admission is open to faculty and students of North Carolina State University, and a limited number of fellowships are available through the campus Folger Institute Committee.

ACCOUNTING

See Division of Economics and Business

COMMUNICATION

Winston Hall (Room 201)

Professor W. J. Jordan, *Head of the Department*

Associate Professor R. S. Rodgers, *Assistant Head of the Department*

Assistant Professor E. T. Funkhouser, *Coordinator of Advising*

Professors: W. G. Franklin, W. J. Jordan, R. S. Rogers; *Professor Emeriti:* C. A. Parker; *Associate Professors:* R. Anderson, L. R. Camp, P. C. Caple, D. A. DeJoy, R. Leonard, L. W. Long, H. E. Munn, Jr., B. L. Russell, R. L. Schrag; *Assistant Professors:* E. T. Funkhouser, V. Gallagher, G. A. Hankins, D. Ivy, M. Javidi, N. H. Snow; *Lecturers:* J. Alchediak, D. L. Baker, C. A. Elleman, T. J. Kauffman, M. Pandich; *Teaching Technician:* M. Drabick.

The Communication program provides training in human communication for professionals entering business, industry, social service and education. The objective is to produce graduates whose understanding of communication problems and solutions makes them uniquely qualified to contribute their expertise to the betterment of society. Recognizing the complexity of human communication acts, the department approaches the study of communication from humanistic, social science, and natural science perspectives with concentrations in communication, mass communication, public relations, communication

disorders, and theatre. The department is strongly committed to training professionals to address the complex human communication problems found in modern business, industry, government and social welfare organizations.

OPPORTUNITIES

Increasingly, organizations are recognizing the need for skilled communication professionals in all facets of the workplace. Consequently, depending upon the area of specialization, graduates may find employment opportunities as communication consultants, media specialists, trainers, public relations specialists, therapists, or performers. In addition, many employers seek graduates with demonstrated competencies in human communication to fill a wide variety of positions which require constant and skillful contact with the public or with personnel.

The department sponsors the Student Communication Association which is open to all majors and offers scholarly and social activities. The department also has a chapter of Alpha Epsilon Rho, the National Honorary Broadcasting Society; a chapter of the Public Relations Student Society of America; a Women in Communications, Inc. student chapter; a chapter of Lambda Pi Epsilon, a national student honorary; a chapter of American Speech, Hearing and Language Student Association; and Black Repertory Theatre.

BACHELOR OF ARTS IN COMMUNICATION

Communication majors are required to earn a grade of C or better in 36 semester hours of Communication. Five courses or 12 credit hours (COM (SP) 190, COM (SP) 110, COM (SP) 112, COM (SP) 200, and COM (SP) 390) are required. Twenty-four (24) additional credit hours are required in one of the five Concentrations: Communication Concentration; Mass Communication Concentration; Public Relations Concentration; Communication Disorders Concentration; or Theatre Concentration. Students must have a 2.0 grade point average to be eligible for graduation.

MINOR IN THEATRE

The Department of Communication offers an academic Minor in Theatre to all majors except those in the Department of Communication. This program is designed to provide the student with a basic understanding of the artistic, technical, and scholarly disciplines of theatre. A total of eighteen hours must be taken to complete the minor, with twelve of these hours in required courses and six in elected courses. Theatre courses are identified in the Communication curriculum by prefixes ending with the number 3. Any student interested in this academic minor should consult the Assistant Head of the Department of Communication.

MINOR IN FILM STUDIES

The Departments of English and Communication and the Division of Multidisciplinary Studies offer a minor in film studies. The minor provides an introduction to the nature of the film experience, some background in the history of the medium, and the opportunity for in-depth study of selected topics. To complete the minor, 15 hours are required, distributed as follows:

Required courses (6 credits) are ENG 282 Introduction to Film and either COM (SP) 364 Film History to 1940 *or* COM (SP) 374 Film History Since 1940, plus nine credit hours selected from the following: ENG 382, ENG 492, COM (SP) 244, COM (SP) 364 *or* 374 (whichever course was not taken to fulfill the required course), MDS (UNI) 480, HI 336, and DN 316 (prerequisite waived, consent of instructor). Any student taking this minor cannot count courses from the minor toward his/her major.

MINOR IN JOURNALISM

(See English Department)

DIVISION OF ECONOMICS AND BUSINESS

R. L. Clark, *Interim Head of Division*

E. W. Erickson, *Director of the Center for Economics and Business Studies*

D. K. Pearce, *Graduate Administrator, Economics Graduate Programs*

B. L. Puryear, *Director of Academic Services and Coordinator of Advising*

A. F. Nowel, *Undergraduate Program Adviser*

T. J. Stiles, *Career Planning and Placement Counselor*

Young men and women interested in preparing for careers in private industry, public and private accounting, and government or for graduate study in economics, accounting, business or law should consider one of the degree programs available through the Division of Economics and Business. The division offers programs of study leading to Bachelor of Arts degrees in accounting, business management, and economics. A Bachelor of Science degree in economics is also available. Degree programs in agricultural business management and agricultural economics are included under listing in the College of Agriculture and Life Sciences, Department of Agricultural and Resource Economics.

The division's degree programs in accounting and business management equip students to understand the business environment and make decisions. Students learn the theoretical underpinnings that shape and guide the economy and they receive extensive instruction in applying current management techniques and skills to everyday business problems. The curricula are designed to prepare the student for a lifetime of career development and growth.

The programs in economics are designed to enhance the student's awareness and understanding of how modern economies function. The courses examine both economy-wide and firm concepts, with the latter carefully integrated with the business management and accounting programs.

The division has more than 2000 majors and 100 faculty members. The faculty includes many distinguished scholars who are dedicated to teaching and internationally recognized for their research.

The division offers a variety of master's degrees, including a Master of Science in Management, and a Ph.D. in economics.

FACILITIES

The division maintains microcomputer, mainframe computer access and library facilities to support its teaching programs and faculty research. The Microcomputer Instructional Laboratory consists of IBM Personal Computers linked to printers and memory devices in a local area network. This laboratory is used as an integral part of instruction in some courses and for specific, independent assignments in others. The G. W. Forster Library contains major professional and business journals and certain government publications that are available to students for completing course assignments and for independent study. The Programming Applications Laboratory provides technically trained clerical and programming personnel to assist in the preparation of work for mainframe computing. Computer terminals that provide access to the mainframe are available throughout the campus.

CAREER PLANNING AND PLACEMENT

The division along with the Career Planning and Placement Center assists students in understanding their career interests and aptitudes and helps them develop programs of study that will lead to various career opportunities.

Internships and Cooperative Education enable qualified students to acquire valuable work experience in conjunction with their studies. Both programs help students refine their career goals.

To enhance students' employment opportunities following graduation, the division and the Career Planning and Placement Center work closely with businesses and governmental representatives. Workshops are provided to students on a regular basis on interviewing, resume writing, and job search skills. Graduates find employment in commercial, accounting, financial and industrial establishments in the local area and throughout the nation.

CURRICULA

The division is organized into two departments: Accounting, and Economics and Business. All of the Bachelor of Arts degrees offered by the division require 24 semester hours in common. This course work includes: EB 301 (microeconomics), EB 202 and 302 (macroeconomics), EB 350 (statistics), CSC 200 (computer science), and 9 semester hours of departmental electives. The departmental electives include courses offered by the division or other courses approved by the program leader prior to being taken. (Additionally, students complete the introductory microeconomics course, EB 201, as part of their social science requirement.)

Beyond this common course work, students are required to take more specialized courses consistent with their degree program as outlined below.

Double majors in business management and Spanish and business management and French are also available.

ELECTIVE COURSES

All of the division's degree programs contain a substantial amount of course work as outlined below that is flexible and can be selected by the student with the aid of his or her adviser. Courses are available in such fields as: accounting, business management, economics, agricultural economics, finance, business law, marketing, agricultural business, human resources and production. (Courses offered are listed in the Course Description portion of this catalog under the following headings: Accounting, Agricultural and Resource Economics, Business Management, and Economics.)

DIVISION RESIDENCY REQUIREMENT

To be eligible for a degree in the Division of Economics and Business, students must complete a minimum of 50 percent of the departmental course requirements above EB 201 (212) and 202 in residency at NCSU. Additional requirements may exist for specific degree programs within the division.

ACCOUNTING

Professor C. J. Messere, *Head of the Department*

KPMG Peat Marwick Professor: C. J. Messere

Professors: P. W. Williams; *Professor Emeritus:* P. R. Windham; *Associate Professors:* J. W. Bartley, K. B. Frazier, J. M. Rockness, G. J. Zuckerman; *Assistant Professors:* F. A. Buckless, Y. A. Chen, R. L. Peace, J. L. Rodgers, R. B. Sawyers; *Lecturers:* E. R. Carraway, H. O. Griffin, G. A. Marsh, C. J. Skender, L. B. Thorne.

The Department of Accounting offers a Bachelor of Arts degree in accounting. Accounting is an information system for measuring, processing and communicating financial information. This information allows users to make reasoned choices among alternative uses of scarce resources in the conduct of business activities.

Many career opportunities are available to accountants in the fields of public accounting, management accounting, governmental accounting, and not-for-profit accounting. Public accountants offer auditing, tax preparation and planning, management consulting, and other accounting services to their clients on a fee basis. Management or industrial accountants are employed by private businesses to provide internal accounting services for the firm. Their duties include the design and maintenance of the financial and cost accounting systems, product costing, budget preparation and operational auditing. Governmental units and other not-for-profit entities have informational needs similar to private busi-

nesses. Accountants employed by such entities perform many of the same functions. Accountants in some governmental agencies, such as the SEC, IRS and FBI, serve the dual function of auditing and law enforcement.

Certified public accountants (CPAs), certified management accountants (CMAs), certified internal auditors (CIAs) and certified cost analysts (CCAs) are individuals who, like doctors, dentists, and lawyers, are licensed to practice their profession. Such certifications are granted to those accountants who pass a qualifying examination and meet certain accounting experience and educational requirements.

BACHELOR OF ARTS IN ACCOUNTING

In addition to the college and common course requirements described above, the Bachelor of Arts degree in accounting includes 24 hours of accounting courses and a course in business law.[1]

		Credits
ACC 210	Accounting I	3
ACC 220	Accounting II	3
ACC 310	Intermediate Finan. Acct. I	3
ACC 311	Intermediate Finan. Acct. II	3
ACC 320	Managerial Uses of Cost Data	3
ACC 330	Intro. to Income Taxation	3
ACC 312	Intermediate Finan. Acct. III	3
ACC 450	Auditing Financial Information[2]	3
EB 307	Business Law I	3
Common Course Work		24
		51
Minimum Hours Required for Graduation		124

[1]To be eligible for a degree in accounting, at least 12 hours from the following required courses must be completed in residency at NCSU: ACC 310, 311, 312, 330, and 450[2].

[2]Or another approved 400 level accounting course.

Beyond these minimum requirements, students should plan (with the aid of their adviser) to complete additional course work to fulfill the requirements of their career objectives. For example, CPA candidates should take ACC 430, 460, 470, 490 and EB 308. CMA candidates should also take ACC 420. The additional course work plan is flexible and depends upon the student's background and career orientation. Some of these courses may be required or suggested by various professional certifying boards. The additional courses can be included in the curriculum categories labeled either "departmental" or "free" electives. In some cases, the additional course work will require either an extra semester or summer school attendance (i.e., in addition to the minimum 124 semester hours required for graduation).

MINOR IN ACCOUNTING

The Department of Accounting offers a minor in accounting to any undergraduate degree student outside the Division of Economics and Business. The accounting minor is offered to students interested in gaining a basic knowledge of accounting and an understanding of how accounting information is used to make rational decisions by individuals, businesses, and society. The minor requires 15 hours of accounting courses and includes an introduction to financial, managerial, and tax accounting principles and practices. The minor is not intended to prepare students for a professional accounting career. Please consult the division for specific information about admission and other requirements.

ECONOMICS AND BUSINESS

Professor D. M. Holthausen, *Associate Department Head for Business Management*

Professor D. Fisher, *Associate Department Head for Economics*

University Distinguished Professor: V. K. Smith

Professors: S. G. Allen, R. L. Clark, E. W. Erickson, R. M. Fearn, T. G. Grennes, J. D. Hess, D. N. Hyman, C. P. Jones, C. R. Knoeber, D. K. Pearce, J. J. Seater, V. K. Smith, C. B. Turner, J. W. Wilson; *Adjunct Professor:* J. B. Hunter, Jr.; *Professors Emeriti:* A. J. Bartley, D. R. Dixon, B. M. Olsen; *Associate Professors:* D. S. Ball, D. L. Baumer, J. C. Dutton, Jr., D. J. Flath, E. Gerstner, A. R. Hall, J. S. Lapp, S. J. Liebowitz, S. E. Margolis, E. A. McDermed, M. B. McElroy, C. M. Newmark, R. B. Palmquist, J. C. Poindexter, Jr., R. J. Rossana, R. R. Rucker, W. N. Thurman, W. J. Wessels; *Associate Professor Emeriti:* C. L. Harrell, Jr.; *Assistant Professors:* A. Agrawal, L. A. Craig, A. E. Headen, Jr., R. S. Krishnaswamy, K. Mitchell, Y. E. Tang; *Assistant Professor Emeriti:* O. G. Thompson; *Lecturers:* J. M. Baumer, J. P. Huggard, C. B. Kimbrough, B. L. Puryear; *Associate Members of the Faculty:* R. J. Bernhard (Industrial Engineering), D. A. Dickey (Statistics).

The Department of Economics and Business offers Bachelor of Arts degrees in business management and economics and a Bachelor of Science degree in economics. Successful

completion of an undergraduate degree in economics or business management prepares a student for careers in business or government and for advanced education. Graduates have been actively recruited by employers seeking individuals with management potential and a well-rounded business education. A wide range of career opportunities are available to students in either program including: finance and banking, marketing, sales, manufacturing and production, personnel management and public administration. Students from either program have an excellent background for graduate work in economics, business, law and related fields.

BACHELOR OF ARTS IN BUSINESS MANAGEMENT

In addition to the college and common course requirements, the Bachelor of Arts degree in business management includes two courses in accounting and one course in each of three areas: business law, marketing, and finance. Business management majors also complete a two-course business concentration (see listing below) and two economics electives.

		Credits
ACC 210	Accounting I	3
ACC 220	Accounting II	3
EB 307	(or 306 or 405) Business Law I	3
EB 313	Marketing Methods	3
EB 320	Financial Management	3
Business Concentration[1]		6

	Credits
Economics Electives[2]	6
Common Course Work	24
	51
Minimum Hours Required for Graduation	124

[1]Select two courses from ONE of the following groups: Finance—EB 404, 420, 422, 504, 520, 522, 524; Managerial—EB 325, 425, 525, ACC 320; Labor and Personnel—EB 326 or 332 (choose one), AND EB 431, 526 or 532 (choose one); Agricultural Business—EB 303, 311, 415, 430; Accounting—ACC 320, 330, 420; Marketing—EB 460, 465, 495N, 513, 560; International Business—EB 346, 448, 495N.
[2]Select two courses from the following: EB 370, 371, 404, 410, 413, 430, 431, 433, 435, 436, 437, 442, 448, 451, 470, 475, 490, 501, 502, 512, 515, 521, 533, 540, 551, 570.

MINOR IN BUSINESS MANAGEMENT

The Department of Economics and Business offers a minor in business management to undergraduate degree students outside the Division of Economics and Business. The business management minor is offered to students interested in gaining basic knowledge about business. Students will learn the fundamentals of accounting, marketing, and finance and will be able to enhance these areas with related courses or diversify by taking courses in other areas of business. To complete the minor, 15 hours of course work are required. Please consult the division for specific information about admission and other requirements.

BACHELOR OF ARTS IN ECONOMICS

In addition to the college and common course requirements, the Bachelor of Arts degree in economics includes an additional 12 semester hours of departmental electives and 15 additional hours of economics electives. This program requires that students take more advanced economics courses than are required in the other degree programs. These advanced courses are structured in an elective format to provide students the opportunity to design a program with the aid of their adviser that will best complement their educational or career objectives.

	Credits
Common Course Work	24
Department Electives[2]	12

	Credits
Economics Electives[1]	15
	51
Minimum Hours Required for Graduation	124

[1]Courses are to be selected from the following: EB 370, 371, 404, 410, 413, 430, 431, 433, 435, 436, 437, 442, 448, 451, 470, 475, 490, 501, 502, 512, 515, 521, 533, 540, 551, 570.
[2]Any course offered by the division or other courses approved by the program leader prior to being taken.

BACHELOR OF SCIENCE IN ECONOMICS

The Bachelor of Science degree in economics provides training in the analytical methods and the body of knowledge of economic theory. This training is enhanced by the mathematics, sciences, and technical courses that are integral parts of the B.S. program.

Included in the economics program are 27 hours of prescribed and elected courses as outlined below:

		Credits
CSC 200	Intro. to Computers & Their Uses	3
EB 201	Economics I	3
EB 202	Economics II	3
EB 301	Intermediate Microeconomics	3
EB 302	Intermediate Microeconomics	3
EB (ST) 350	Economics & Business Stat.[1]	3
Departmental Elective[2]		3
Economics Electives[2]		6
		27

Minimum Hours Required for Graduation 127

[1]ST 350, 361, or 372 may substitute for EB 350. Credit will not be granted for more than one of these courses.
[2]Select two courses from the following: EB 370, 371, 404, 410, 413, 430, 431, 433, 435, 436, 437, 442, 448, 451, 470, 475, 490, 501, 502, 512, 515, 521, 533, 540, 551, 570.
[2]Any course offered by the division or other courses approved by the program leader prior to being taken.

MINOR IN ECONOMICS

The Department of Economics and Business offers a minor in economics to any undergraduate degree student outside the Division of Economics and Business. The minor is offered to students interested in learning to apply economics to contemporary problems. It is not intended to prepare students for a professional career in the field of economics but to provide a program of study leading to the basic comprehension of economics. To complete the minor 15 hours of course work are required. Please consult the division for specific information about admission and other requirements.

ENGLISH

Tompkins Hall (Rooms 131, 246)

Professor J. E. Bassett, *Head of the Department*

Associate Professor C. A. Prioli, *Associate Head of the Department*

Associate Professor C. E. Moore, *Assistant Head for Scheduling*

Senior Lecturer P. R. Cockshutt, *Coordinator of Advising*

Professor W. E. Meyers, *Director of Freshman Program*

Alumni Distinguished Undergraduate Professors: L. S. Champion, M. T. Hester, A. S. Knowles, Jr.

Professors: B. J. Baines, J. E. Bassett, P. E. Blank, Jr., L. S. Champion, J. D. Durant, J. A. Gomez, A. H. Harrison, M. T. Hester, L. T. Holley, K. F. Holloway, A. S. Knowles, L. H. MacKethan, W. E. Meyers, C. R. Miller, M. S. Reynolds, L. Smith, J. J. Smoot, A. F. Stein, W. B. Toole, III, J. N. Wall, M. C. Williams, R. V. Young, Jr.; *Adjunct Professor:* D. D. Short; *Professors Emeriti:* M. Halperen, H. G. Kincheloe, B. G. Koonce, F. H. Moore, P. Williams, Jr.; *Associate Professors:* G. W. Barrax, L. J. Betts, Jr., E. D. Clark, J. W. Clark, Jr., D. H. Covington, J. Ferster, J. M. Grimwood, H. A. Hargrave, J. J. Kessel, M. F. King, D. L. Laryea, C. E. Moore, C. A. Prioli, L. S. Rudner, H. C. West, D. B. Wyrick; *Adjunct Associate Professor:* E. D. Engel; *Associate Professors Emeriti:* E. P. Dandridge, Jr., P. H. Davis, J. B. Easley, A. B. R. Shelley, N. G. Smith; *Assistant Professors:* E. T. Amiran, M. M. Brandt, M. P. Carter, C. E. Chaski, V. C. Downs, B. A. Fennell, C. Gross, W. E. Haskin, C. G. Herndl, M. G. Huskey, S. B. Katz, R. C. Kochersberger, R. C. Lane, D. C. Miller, J. E. Morrison, M. E. Orr, A. M. Penrose, J. O. Pettis, N. B. Rich, L. R. Severin, J. J. Small, J. F. Thompson, J. M. Unsworth; *Adjunct Assistant Professor:* S. K. Burton; *Senior Lecturer:* P. R. Cockshutt; *Lecturers:* G. G. Acuff, D. H. Ball, C. Blankenship, R. D. Botvinick, T. B. Burgin, L. J. Caruso, A. Davis-Gardner, H. E. Dickerson, S. A. Drucker, E. N. Evasdaughter, C. R. Frazier, J. Gaitens, H. J. Gray, S. H. Jobe, A. B. Katz, R. S. Knott, E. H. Koomen, R. E. Lathan, M. M. Lewis, J. Love, N. H. Margolis, E. McDaniel, C. L. McKnight, T. R. McLaurin, K. F. Merris, K. A. Olander, P. Pienkowski, D. P. Real, J. H. Richards, S. M. Setzer.

The Department of English offers basic and advanced courses in writing, language, and literature. The freshman courses, taken by all undergraduate students, develop skill in expository writing and in analytical reading of literary and non-literary works. Advanced courses in communication of technical information, composition and rhetoric, and creative writing give students opportunities to pursue special personal and career interests, as do courses in literature, linguistics, film, and folklore. The department offers a Bachelor of Arts major in English with three options—literature and language, writing and editing, and teacher certification—and a Bachelor of Science major. See listing of graduate degrees offered.

A certificate in professional writing is available to students not seeking the bachelor's degree. Also available are a minor in English, a minor in Comparative Literature (offered jointly with the Department of Foreign Languages and Literatures), a minor in Second Language Acquisition (offered jointly with the Department of Foreign Languages and Literatures), and a minor in Journalism (offered jointly with the Department of Communication). An internship program combines work experience with courses in writing and editing.

OPPORTUNITIES

A degree in English provides both vocational training and liberal education. It leads to careers in such fields as teaching, journalism, advertising, public relations, personnel management, technical writing, business writing, and creative writing. It sharpens the analytical and interpretive skills needed for strong business management, and it serves as an excellent pre-professional degree for students planning to study law or medicine and for those intending to do graduate work in literature and composition.

BACHELOR OF ARTS IN ENGLISH

Major in English—The student must schedule 42 semester hours beyond the usual six hours in freshman composition. Basic requirements include the sophomore survey of English literature, the sophomore survey of American literature, a course in Shakespeare, and a seminar in literary criticism. Beyond these courses, the student may pursue special interests within the limits of recommended categories.

Major in English, Writing and Editing Option—The student must schedule 39 semester hours beyond the usual six hours in freshman composition. Courses include journalism, copyediting, advanced writing, literature, and, in the final semester, a seminar in writing-editing (ENG 495). Additionally the student must schedule 15-18 semester hours in a chosen track or discipline outside the department.

Major in English, Teacher Education Option—English majors may enroll in the teacher education option offered by the College of Humanities and Social Sciences in cooperation with the College of Education and Psychology. Students who complete this program are eligible to apply for certification to teach English in secondary schools in North Carolina. The requirements of the program include 34 semester hours in professional courses and 33 semester hours in English beyond the usual six hours in freshman composition. (Total 127 credit hours required for graduation.) Students desiring to enter this program should declare their intention before the spring of the sophomore year and are required to file a formal application for admission which must be approved in order for them to participate. Enrollments in the Teacher Education Option may be limited.

BACHELOR OF SCIENCE IN ENGLISH

Concentration in English—The student, in consultation with his or her department adviser, must schedule 27 semester hours beyond the usual six hours in freshman composition.

MINOR IN COMPARATIVE LITERATURE

The Departments of English and of Foreign Languages and Literatures offer a minor in Comparative Literature to all undergraduate students. It requires six courses: FL 350 or ENG 590, CL 495, and four courses, in one or more literatures (other than a student's major), chosen from an approved list. A grade of C or better is required in all courses.

MINOR IN ENGLISH

The English Department offers a minor in English to majors in any field except English. To complete the minor fifteen hours of English courses are required above the 100 level, six hours of which must be at the 300 level or above. A grade of C or better is required in all courses credited to the English minor.

MINOR IN FILM STUDIES

(See Communication)

MINOR IN JOURNALISM

With the Department of Communication, the Department of English offers a minor in Journalism, open to students in any major. It consists of the following courses: ENG 214, ENG 215, ENG 315, COM (SP) 204, and one of the following—COM (SP) 234, COM (SP) 334, COM (SP) 421. A grade of C or better is required in all courses.

MINOR IN LINGUISTICS

The Department of Foreign Languages and Literatures and the Department of English offer a minor in Linguistics to majors in any field. Among students likely to be attracted to the minor are those interested in Second Language Acquisition. To complete the minor fifteen hours of designated courses are required, as well as the completion of a foreign language through the 202 level.

FOREIGN LANGUAGES AND LITERATURES

1911 Building (Room 120)

Professor J. H. Stewart, *Head of the Department*

Associate Professor A. C. Malinowski, *Assistant Head of the Department and Coordinator of Advising*

Professor G. G. Smith, *Scheduling Officer*

Professors: T. P. Feeny, G. Gonzalez, J. R. Kelly, M. Paschal, G. G. Smith, J. H. Stewart, M. A. Witt; *Professors Emeriti:* A. A. Gonzalez, G. W. Poland, E. M. Stack, H. Tucker, Jr.; *Associate Professors:* R. A. Alder, S. T. Alonso, L. L. Cofresi, T. N. Hammond, W. M. Holler, M. M. Magill, A. C. Malinowski, L. A. Mykyto, V. M. Prichard, E. W. Rollins, Y. B. Rollins, S. E. Simonsen; *Assistant Professors:* J. C. Akers, H. G. Braunbeck, G. A. Dawes, M. L. Salstad, M. L. Sosower, W. G. Tschacher; *Visiting Assistant Professor:* S. Yamahashi; *Lecturers:* D. G. Adler, A. B. Kennedy; *Instructors:* V. Bilenkin, D. M. Marchi, J. P. Mertz, G. P. Meyjes.

OPPORTUNITIES

Languages are the keys to the world. The continuous expansion of international relations makes the knowledge of foreign languages a critical need for today's professional. The student of foreign languages is not limited to teaching, translating or interpreting. There are careers in politics, diplomacy, commerce, banking, agriculture, science, and research

in which a thorough knowledge of foreign languages is crucial for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.

BACHELOR OF ARTS IN FRENCH OR SPANISH

All the general requirements for the Bachelor of Arts degree must be met, including six hours of literature survey within the Department of Foreign Languages and Literatures or in British and American literature or any combination of these. Degree designations are: B.A. in French Language and Literature, B.A. in Spanish Language and Literature, B.A. in French Language and Literature with Teacher Education option, and B.A. in Spanish Language and Literature with Teacher Education option.

Outstanding students may become members of Alpha Lambda, campus chapter of Phi Sigma Iota, National Foreign Languages Honor Society; of Xi Omicron, campus chapter of Sigma Delta Pi, National Hispanic Honor Society; and of Gamma Alpha, campus Chapter of Dobro Slovo, National Slavic Honor Society.

Major in French or Spanish—Students must complete 36 hours beyond the 201 level, including a senior seminar. Majors must take 12 additional hours of advised electives. These are waived for double majors such as Business and Spanish or Business and French.

Double Major in Business Management and Spanish or French—The B.A. degree double major in Business Management and Spanish or French is a curriculum sponsored by the Department of Economics and Business and the Department of Foreign Languages and Literatures. Students enrolled in this program have the opportunity to complete the 139 hours required for both majors within a four-year period.

Major in French or Spanish with Teacher Education Option—In collaboration with the College of Education and Psychology and the Department of Curriculum and Instruction, the department offers a program leading to French or Spanish teacher certification in North Carolina, grades K-12. The requirements of the program include 30 semester hours in professional courses and 39 semester hours in French or Spanish beyond the 102 level. Candidates must consult with their academic adviser as early as possible for the proper planning of their curriculum. Application for admission to Teacher Education Candidacy is made during the spring semester of the sophomore year. Enrollment in the Teacher Education Option programs may be limited.

Programs Abroad—The department offers summer programs in Austria, France, Mexico and Germany, and a semester-long program in Spain.

MINOR IN CLASSICAL STUDIES

The minor in Classical Studies offers an excellent foundation for advanced work in other academic disciplines as well as professional programs in law, medicine and finance. The minor gives students an opportunity to develop a keener perception and better understanding of the cultural forces at work in the contemporary world. And by presenting a broad selection of courses in the various disciplines of literature, philosophy and history, the minor provides students with a sound introduction to studies in antiquity. Requirements for the minor include five courses selected from the following: GRK 201 *or* LAT 201; GRK 310 *or* GRK 320; PHI 300 *or* REL 312; HI 403 *or* HI 404; and HI 405 *or* HI 406.

MINOR IN COMPARATIVE LITERATURE

(See English Department)

MINORS IN FOREIGN LANGUAGES, LITERATURES, AND CULTURES

Minor programs in French, German, Italian, Japanese, Russian, and Spanish involve fifteen hours of study at the 201 level and beyond. A minor program in Classical Greek is also offered that involves fifteen hours of study at the 101 level and beyond. Programs include courses in language, literature, and civilization. Students majoring in any area of

study at NCSU are eligible to minor in a foreign language. Students may not, however, major and minor in the same language.

MINOR IN LINGUISTICS

(See English Department)

HISTORY

Harrelson Hall (Room 162)

Professor W. C. Harris, *Head of the Department*

Assistant Professor J. E. Crisp, *Assistant Head of the Department*

Associate Professor J. A. Mulholland, *Coordinator of Advising*

Alumni Distinguished Undergraduate Professors: B. F. Beers, J. P. Hobbs

Professors: J. R. Banker, B. F. Beers, W. H. Beezley, C. H. Carlton, A. J. DeGrand, M. S. Downs, W. C. Harris, J. P. Hobbs, D. E. King, A. J. LaVopa, L. O. McMurry, G. D. Newby, J. M. Riddle, R. H. Sack, R. W. Slatta, E. D. Sylla, B. W. Wishy; *Professors Emeriti:* M. L. Brown, R. W. Greenlaw, L. W. Seegers, M. E. Wheeler; *Associate Professors:* D. P. Gilmartin, J. A. Mulholland, G. W. O'Brien, J. K. Ocko, S. T. Parker, J. D. Smith, S. L. Spencer, G. D. Surh, K. P. Vickery, K. S. Vincent; *Associate Professor Emeritus:* R. N. Elliott; *Assistant Professors:* J. E. Crisp, W. A. Jackson, W. C. Kimler, K. P. Luria, S. Middleton, P. Tyler; *Adjunct Assistant Professors:* V. L. Berger, J. W. Caddell, J. J. Crow, R. M. McMurry, W. S. Price, Jr., D. J. Olson, H. K. Steen; *Associate Status:* J. Bonham (MDS); *Instructor:* J. Woodard.

An understanding of the historical background of our times is expected of the educated person. The Department of History makes it possible for students to gain this understanding through a wide range and variety of courses at all levels from introductory through graduate.

A broad offering of introductory courses is available to satisfy the undergraduate history requirement or part of the humanities and social sciences requirements in most university curricula. Students in the College of Humanities and Social Sciences are required to take two courses in history—one dealing with a culture significantly different from our own in pre-industrial Western or non-Western societies and the other dealing with our own culture in the United States or post-industrial Western societies.

Honors students are eligible for membership in Phi Alpha Theta.

Some introductory and advanced courses and most graduate courses are offered in the evening.

The department offers two Master of Arts degrees. Students interested in enhancing current teaching credentials or in going on to doctoral work elsewhere may take the traditional graduate program. Students interested in applied history may take the Archival Management program. Some financial assistance is available.

OPPORTUNITIES

A history major has traditionally served as a foundation for careers in such professions as teaching or law. In recent years undergraduates have frequently augmented studies in history with computer science, foreign language, or business administration, combinations which have proved attractive in business and government service. The prospect of new career ladders in public education has prompted renewed interest in an M.A. in history with advanced teaching certification. Multiplication of records of every kind has created a steady demand for historians with master's degrees in archival management.

BACHELOR OF ARTS IN HISTORY

Major in History—A history major must take 30 hours of course work in history in addition to the six hours required of all students in the College of Humanities and Social

Sciences. These 30 hours must include a 491 seminar. At least 24 hours of the 30 must be at the 400 level. Sufficient courses are offered to complete the history requirements for the B.A. through the evening program.

Major in History with Social Studies Teacher Education Option—History majors may enroll in the teacher education program offered by the College of Humanities and Social Sciences in cooperation with the College of Education and Psychology. Students who complete this program are eligible for certification to teach social studies in secondary school in North Carolina. In addition to Bachelor of Arts degree requirements, students are required to take professional courses in education and psychology and additional social sciences courses (132 credit hours required for graduation). Students desiring to enter this program should declare their intention during their sophomore year. Admission is competitive and the criteria include an overall grade point average of 2.5 or better. Enrollments may be limited in Teacher Education Option Programs.

BACHELOR OF SCIENCE IN HISTORY

A concentration in history involves 18 hours of course work beyond the six hours required of all students in the College of Humanities and Social Sciences plus a senior seminar. Of the 18 hours, at least 12 must be at the 400 level.

MINOR IN HISTORY

A minor in history shall consist of six courses in history: one introductory course in preindustrial or non-Western history (i.e., HI 207, 208, 209, 215, 216, 263, 264, 275, or 276); one introductory course in United States or post-industrial Western history (i.e., HI 205, 210, 221, 222, 233, 243, 244, 251 or 252); four three-hour courses in history at the 300 level or above, two of which must be on the 400 level. All six courses must be completed with a grade of C or better to satisfy the requirements of the minor.

MULTIDISCIPLINARY STUDIES

Harrelson Hall (Room 144)

Professor J. W. Wilson, *Head*

Professor C. D. Korte, *Assistant Head*

Alumni Distinguished Undergraduate Professor: J. W. Wilson

Professors: D. A. Adams, J. A. Gomez, D. B. Greene, C. D. Korte, J. W. Wilson; *Professors Emeriti:* A. C. Barefoot, J. R. Lambert, Jr.; *Associate Professors:* T. N. Hammond, R. L. Hoffman; *Assistant Professor:* J. C. Bonham, B. H. Grimes, R. E. Rice, R. A. Waschka, II; *Lecturers:* E. Malloy-Hanley, C. L. Stalnaker.

Multidisciplinary Studies is an academic unit responsible for interdisciplinary programs dealing with contemporary and historical issues and problems. Courses are taught by teams of faculty drawn from the division and from the academic disciplines relating to the problems or issues under consideration. These courses are open without prerequisite to students in all curricula.

BACHELOR OF ARTS IN MULTIDISCIPLINARY STUDIES

Multidisciplinary Studies Committee

Professor J. W. Wilson (Multidisciplinary Studies), *Chair*

Associate Professor L. M. Antony (Philosophy and Religion)

Lecturer C. B. Kimbrough (Economics and Business)

Associate Professor A. C. Malinowski (Foreign Languages and Literatures)

Assistant Professor R. S. Moog (Political Science and Public Administration)

The multidisciplinary studies program allows a student to design his or her own academic major. Instead of following the requirements for a major in *one* of the traditional disciplines, the candidate for the Bachelor of Arts degree in multidisciplinary studies has the responsibility of organizing a concentration or field specialization from *two or more* disciplines. A concentration in Latin American Studies might, for example, combine related courses in language, literature, history, economics, sociology, and political science.

Two concentrations have been established primarily for the benefit of evening students. These are 1) American Studies: Cultural, Social, and Political and 2) Business Organization and Communication. All courses required for completion of these concentrations will be available in the evening.

The freshman and sophomore basic requirements for the multidisciplinary studies program are the same as for the other Bachelor of Arts programs in humanities and social sciences. In satisfying basic requirements in language, humanities, social science, mathematics, and natural science, the student should, whenever possible, choose those courses that are most appropriate as background for the courses in his or her major concentration.

Admission to the Program

To become a candidate for a major in multidisciplinary studies, a student first secures application forms and information from the office of the chair of the Multidisciplinary Studies Committee (144 Harrelson), then prepares a tentative proposal which includes a list of courses comprising 30 credit hours and an essay of 300-500 words explaining his or her reasons for desiring to make this set of courses the field of specialization. The student's proposal is reviewed by a faculty sponsor and submitted to the Multidisciplinary Committee for consideration. After a thorough examination to determine whether the set of courses proposed as a multidisciplinary major is academically sound and coherent, the committee will recommend that the Dean of Humanities and Social Sciences accept the proposal; or it will be sent back to the student and his or her sponsor with suggestions for modification and resubmission.

MINOR IN AFRICAN-AMERICAN STUDIES

The African-American Studies Minor provides a comparative and interdisciplinary study of the Black experience in Africa and the Americas. Three required courses include an introduction to African-American studies (MDS (UNI) 240), Black American literature (ENG 248), and Afro-American history (HI 372 or 373). Two elective courses may be selected from a list of designated courses in such disciplines as anthropology, history, language, sociology, social work, and communication. The minor is designed to bring together students from diverse backgrounds and curricula who share a common interest in the African-American experience.

MINOR IN ENVIRONMENTAL SCIENCE

Provides opportunity for non-science majors to acquire basic understanding of interrelationships between humans and the environment. Includes natural and social science courses that help to integrate disciplines and provide the foundation for analyzing environmental issues.

MINOR IN FILM STUDIES

(See Communication)

MINOR IN SCIENCE, TECHNOLOGY, AND SOCIETY

The Science, Technology, and Society minor is a fifteen hour, multidisciplinary minor providing students an opportunity to appreciate and understand better the roles that

science and technology play in the larger sociocultural context. A goal of the minor is to help students develop the ability to order and integrate the diverse aspects of their educations. Two essential components of this ability are sensitivity to the moral dimensions of scientific, and technological inquiry as affecting how people may live or want to live, and an appreciation of the practical implications of scientific and technical theory. In addition, the Science, Technology, and Society minor enables students to increase the breadth of their familiarity with science and technology.

MINOR IN WOMEN'S STUDIES

The Women's Studies minor offers all students in the university the opportunity to study the role of women in society. The minor will enable students to develop a better understanding of how women's positions in various societies have arisen and evolved.

PHILOSOPHY AND RELIGION

Winston Hall (Room 101)

Professor E. A. Martin, *Head of the Department*

Associate Professor L. M. Antony, *Assistant Head of the Department*

Professor A. D. Van DeVeer, *Coordinator of Advising*

Alumni Distinguished Undergraduate Professors: W. R. Carter, T. H. Regan

Professors: W. R. Carter, E. A. Martin, T. H. Regan, J. C. VanderKam, A. D. VanDeVeer; *Professor Emeriti:* P. A. Bredenberg, R. S. Bryan; *Associate Professors:* L. M. Anthony, D. F. Austin, W. C. Fitzgerald, R. M. Hambourger, B. B. Levenbook, H. D. Levin, J. Levine, C. M. Pierce; *Associate Professors Emeriti:* W. L. Highfill, R. S. Metzger; *Assistant Professors:* W. Adler, D. D. Auerbach, M. K. Cunningham, R. B. Mullin, A. Reath, T. K. Stewart; *Associate Member of the Department:* G. D. Newby (History), C. L. Stalnaker (Multidisciplinary Studies).

The Department of Philosophy and Religion at North Carolina State University renders two major services to its students. 1) In the discipline of philosophy, it offers an array of courses which examine the great philosophic ideas of western civilization, and in the discipline of religion, it offers courses which examine the religious concepts and principles that have had an impact on all of civilization. 2) It provides an opportunity for extensive technical study in philosophy for students who wish to concentrate in this field either for its own sake or as an ideal intellectual foundation for subsequent graduate or professional study.

HONORS PROGRAMS IN PHILOSOPHY

The Department of Philosophy and Religion offers an Honors Program to provide an opportunity for qualified students to pursue a more challenging and individualized course of study.

Students who qualify may elect to take as little as one course on an honors basis. However, those students who desire to enroll in the honors program and to have their transcripts include the words, "With Honors in Philosophy," are required (a) to complete a major in philosophy, and (b) to complete satisfactorily a minimum of fifteen hours (including Philosophy 335) of honors work. Students pursuing these goals will be referred to as "students seeking honors in philosophy."

HONORS PROGRAM IN RELIGIOUS STUDIES

The Department of Philosophy and Religion offers an Honors Program in Religious Studies to provide an opportunity for qualified students to pursue a more challenging, individualized, and directed course of study than that afforded by the general Area of Concentration in Religious Studies.

Students who qualify may elect to take as little as one course on an honors basis. However, those students who desire to enroll in the honors program and to have their transcripts include the words, "With Honors in Religious Studies" are required to (a) complete the degree program for Philosophy with an Area of Concentration in Religious Studies; and (b) to complete a minimum of twelve credit hours of honors work in Religious Studies. Students pursuing these goals will be referred to as "students seeking honors in religious studies."

SCHOLARSHIP

The Claire Simmons Allan-Samson Memorial Scholarship in Moral Philosophy, a renewable scholarship of $1000 per year, will be awarded annually to worthy students who have expressed an interest in issues in animal rights.

OPPORTUNITIES

For students interested in postgraduate study, information compiled by post-college professional schools reveals that undergraduate philosophy majors who apply to graduate schools of management have in the past scored extremely well in combined total scores on the Graduate Management Admission Test, with exceptional scores on verbal fields. Those undergraduate philosophy majors who apply to law schools have been shown to be more likely to be admitted than virtually any other field represented, and medical schools have also shown a significant preference for philosophy majors in their admissions. Students intending to study philosophy in graduate programs have consistently scored much higher than other students on the verbal section of the Graduate Record Examination. Because of this capability of scoring so well on the various postgraduate tests, many businesses and industries welcome philosophy majors into their training programs.

BACHELOR OF ARTS IN PHILOSOPHY

Candidates for the Bachelor of Arts degree in philosophy must complete 30 hours in philosophy, including either Logic (PHI 201) or Symbolic Logic (PHI 335); the courses in the development of western philosophic thought (PHI 300, 301), a course in value theory (PHI 275, 308, 309, 311, 312, 313, 314, 321, 322) and a course in contemporary philosophy (PHI 319, 331, 332).

Major in Philosophy with a Concentration in Religious Studies—This program is designed especially to prepare students for theological seminary or graduate work in religion as well as to introduce them to the discipline of religious studies. Candidates for the Bachelor of Arts degree in philosophy with a concentration in religious studies must complete 33 hours, including 12 hours in philosophy and 21 hours in religion. The courses in philosophy must include a course in the development of western philosophic thought (PHI 300, 301); a course in value theory (PHI 275, 308, 309, 311, 312, 313, 314, 321, 322); and the course in the philosophy of religion (PHI 305). The courses in religion must include a course in biblical studies (REL 201, 311, 312); a course in non-western religions (REL 331, 332, 407, 408); a course in the history of western religion (REL 317, 318, 320, 323, 324, 326); and a course in theology and culture (REL 309, 327).

Major in Philosophy with a Concentration in Philosophy of Law—The program is designed to help students develop the ability to think critically about the role of the law and the values that it reflects. Because of its interdisciplinary nature, it provides a strong foundation for professional legal education. The concentration requires a minimum of 30 hours in philosophy (including the course taken to meet school requirements) and a minimum of 9 hours in political science. Three advised electives are required in addition to five core courses: PHI 309, PHI 312, PHI 313, PS 308 and PS 361. Four background courses, which are required of all philosophy majors, must also be taken: either PHI 201 or PHI 335, PHI 300, PHI 301, and either PHI 319, PHI 331, or PHI 332.

BACHELOR OF SCIENCE IN PHILOSOPHY

Candidates for the Bachelor of Science degree in philosophy must complete 27 hours in philosophy. These must include the courses in the history of western philosophic thought (PHI 300, 301), Symbolic Logic (PHI 335), Philosophy of Science (PHI 340); and a course in value theory (PHI 275, 308, 309, 311, 312, 313, 314, 321, 322).

MINORS IN THE DEPARTMENT OF PHILOSOPHY AND RELIGION

Students wishing to take any of the following academic minors need to complete the departmental form declaring intention to do so.

MINOR IN COGNITIVE SCIENCE

Students who take a minor program in cognitive science are required to complete with a grade of C or better fifteen hours of courses, distributed as follows: PSY 320 (Cognitive Processes); PSY 340 (Environmental Ergonomics); *or* PSY 545 (Human Information Processing); PHI 331 (Philosophy of Language); PHI 332 (Philosophy of Psychology); PHI/PSY 425/525 (Introduction to Cognitive Science).

MINOR IN PHILOSOPHY

Students who take a minor program in philosophy are required to complete with a grade of C or better fifteen hours of courses in selected fields in philosophy, including (A) a course in the history of philosophy (3 credit hours), (B) a course in normative (ethics and ethics-related) philosophy (3 credit hours), (C) a course other than one in normative philosophy, but not including logic or the history of philosophy (3 credit hours).

MINOR IN RELIGIOUS STUDIES

Students who take a minor program in religious studies are required to complete with a grade of C or better fifteen hours of courses in selected fields of religious studies. In order to ensure a wide study of the field, students are required to select at least one course in Western religious traditions and at least one course in non-Western religious traditions. REL 101 and REL 102 may not be counted in the minor.

PHYSICAL EDUCATION

Carmichael Gymnasium (Room 2000)

Professor A. Lumpkin, *Head of the Department*

Professors: A. Lumpkin; *Professor Emeritus:* F. R. Drews, R. A. Lauffer; *Associate Professors:* A. L. Berle, H. L. Brown, J. M. Daniels, T. W. Evans, C. E. Patch, J. L. Shannon, W. H. Sonner; *Associate Professors Emeriti:* N. E. Cooper, J. B. Edwards, A. M. Hoch, H. Keating, W. R. Leonhardt; *Assistant Professors:* S. V. Almekinders, A. Attarian, J. V. Brothers, W. A. Cheek, R. C. Combs, K. L. Davis, J. L. Dewitt, R. G. Gwyn, S. C. Halstead, S. R. Hawkes, J. W. Isenhour, Jr., V. M. Leath, G. W. Pollard, M. S. Rhodes, T. C. Roberts, R. R. Smith, J. W. Stewart; *Assistant Professors Emeriti:* W. M. Shea, E. A. Smaltz; *Lecturers:* J. K. Bartlett, III, R. N. Bechtolt, J. R. Bonner, D. S. Clark, K. K. Criswell, J. R. Harkins, J. R. Kascenska, R. H. Kidd, M. R. Lester, I. F. Ormond, D. L. Peterson, C. E. Raynor, D. A. Rice, E. V. Smith, R. H. Taylor, G. E. Wall, T. C. Winslow, G. R. Youtt; *Associate Members of the Faculty:* D. L. Ridgeway (Statistics and Physics), and M. M. Turnbull (Health Services).

All North Carolina State University students are required to complete four semesters of physical education to meet graduation requirements. Freshmen are expected to take PE 100, Health and Physical Fitness, in either the fall or the spring semester of their freshman year. Students who do not pass a survival swimming test must enroll in and attempt to pass a beginning swim class.

Students may participate in a known sport or learn a totally new activity while selecting their other courses. Students with disabling conditions will be helped by physical education

and Student Health Service professionals in choosing appropriate classes. Only "activity" courses, not elective "theory" courses, can be used to meet the university physical education requirement.

MINOR IN PHYSICAL EDUCATION (COACHING EMPHASIS)

The Department of Physical Education offers an 18-hour minor in Physical Education (Coaching Emphasis), designed to prepare students to assume coaching responsibilities with a sound theoretical background. The minor provides knowledge of pertinent anatomical, physiological, and biomechanical principles; appreciation for the prevention and treatment of athletic injuries; development of observation and communication skills; and demonstration of motor skills and strategies involved in coaching specific sports.

POLITICAL SCIENCE AND PUBLIC ADMINISTRATION

Caldwell Hall (Room 211)

Professor M. S. Soroos, *Head of the Department*

Associate Professor H. G. Kebschull, *Assistant Head and Coordinator of Advising*

Professor J. H. Svara, *Director of Master of Public Affairs Program*

Alumni Distinguished Undergraduate Professors: A. Holtzman, J. P. Mastro

Professors: E. S. Fairchild, G. D. Garson, A. Holtzman, E. R. Rubin, M. S. Soroos, J. H. Svara, D. W. Stewart, J. O. Williams; *Professors Emeriti:* W. J. Block, J. T. Caldwell; *Associate Professor Emeriti:* K. S. Petersen; *Associate Professors:* C. K. Coe, D. M. Daley, R. H. Dorff, J. H. Gilbert, H. G. Kebschull, S. H. Kessler, J. P. Mastro, J. M. McClain, E. O'Sullivan, T. V. Reid, J. E. Swiss, M. L. Vasu; *Assistant Professor:* C. E. Griffin, R. S. Moog.

The Department of Political Science and Public Administration offers basic and advanced courses in all major fields of the discipline: American government and politics (local, state, and national), public law and criminal justice, public administration, comparative politics, international relations and global issues, political theory and methodology of political science. The department affords opportunities for the study of government and administration to students in other curricula and schools.

Graduate courses in political science are available to advanced undergraduates. See listing of graduate degree programs and consult the Graduate Catalog.

The department provides opportunities for internships in state and local government including the North Carolina General Assembly Legislative Internship Program.

Majors in political science with distinguished academic achievements are annually invited to join Zeta Epislon Chapter of Pi Sigma Alpha, the national political science honor society.

OPPORTUNITIES

There are a number of careers and professions for which a major in political science, or extensive study of government and politics, can be most useful. This is true especially for those planning to seek careers in teaching, the legal profession, criminal justice agencies, state and local government, urban planning, the federal bureaucracy, journalism or in any of the organizations that seek to monitor political processes or to influence the content of public policy. Private firms also seek managers and public affairs specialists who have a knowledge of the functioning of the political system and of politics in general.

BACHELOR OF ARTS IN POLITICAL SCIENCE

Major requirements are: 30 hours (in addition to any political science course which may be taken to satisfy the 12-hour social science requirement), 21 of which must be at the 300-level or above; PS 201 or equivalent; at least six hours in each of three pairs of subfields (Pair A: American Politics/Policy and Administration; Pair B: International or Comparative Politics; Pair C: Political Theory/Scope and Methods); and a Political Science Seminar (indicated by the letter "S" following its number, or by the word "seminar" in its title).

Criminal Justice Option—The Departments of Political Science and Public Administration and Sociology, Anthropology and Social Work offer undergraduate majors an option in criminal justice. This option includes 28 semester hours of specialized study. The program develops students who may move into middle management and policy making positions in agencies such as police, court, correctional, probation and parole agencies.

Students interested in criminal justice should contact Dr. Eva R. Rubin, 223 Caldwell Hall, Political Science and Public Administration or Dr. Matthew Zingraff, 312 1911 Building, Sociology, Anthropology and Social Work.

Law and Political Philosophy Concentration—The concentration in law and political philosophy is an interdisciplinary program designed for students who are interested in the theoretical and legal dimensions of political life. It seeks to develop a broad understanding of the relationship between law and politics and the moral and philosophical questions which are central to both. The law and political philosophy concentration is fulfiiled by successful completion of twelve hours of core course requirements, nine hours of recommended electives, and completion of the normal political science major requirements. Six hours of the core course requirements and at least three hours of the recommended electives will be taken in the Department of Philosophy and Religion. Courses in the concentration provide a humanistic perspective on legal and political questions. The program is suitable for those interested in a career in law or government or those who hope to pursue graduate studies in either political science or philosophy.

Social Studies Teacher Education Option—A major in political science may also choose a teacher education option. This is a 131-credit hour degree program which includes the normal 30-hour major plus the required professional education courses. Successful completion of the program leads to certification to teach social studies in the secondary schools. Enrollments may be limited in Teacher Education Option program.

BACHELOR OF SCIENCE IN POLITICAL SCIENCE

The major requirements for a B.S. degree in political science are identical to the B.A. except that 27 hours of course work in the discipline are required instead of 30.

MINOR IN POLITICAL SCIENCE

A minor in political science may be elected by students from any curriculum. The minor requires 15 hours of political science courses. which must include 9 hours at the 300-level or above and a 400-level seminar course (indicated by the letter "S" following the number or the word seminar in its title). At least three hours must be from each of two of the following three pairs of subfields (Pair A: American Politics/Policy and Administration; Pair B: International or Comparative Politics; Pair C: Political Theory/Social Science Methods).

SOCIOLOGY, ANTHROPOLOGY AND SOCIAL WORK

(Also see Agriculture and Life Sciences)

1911 Building (Room 301)

Professor L. B. Otto, *Head of the Department*

Associate Professor M. P. Atkinson, *Associate Head, CHASS Teaching and Research*

Professor W. B. Clifford, *Associate Head, CALS Teaching and Research*

Professor E. M. Crawford, *Graduate Administrator*

Associate Professor G. D. Hill, *Undergraduate Administrator*

SOCIOLOGY TEACHING AND RESEARCH

Professors: W. B. Clifford, E. M. Crawford, L. R. Della Fave, V. A. Hiday, R. L. Moxley, L. B. Otto, M. M. Sawhney, M. D. Schulman, R. C. Wimberley; *Adjunct Professor:* R. D. Mustian; *Professors Emeriti:* L. W. Drabick, C. P. Marsh, J. N. Young; *Associate Professors:* M. P. Atkinson, R. C. Brisson, G. D. Hill, J. C. Leiter, R. J. Thomson, M. S. Thompson, D. T. Tomaskovic-Devey, K. M. Troost, E. M. Woodrum, M. T. Zingraff; *Assistant Professors:* T. J. Hoban, P. L. McCall, M. L. Schwalbe, A. E. Thompson, C. R. Zimmer; *Assistant Professors Emeriti:* C. G. Dawson, T. M. Hyman.

SOCIOLOGY EXTENSION

Associate Professor S. K. Garber, *Specialist-in-Charge*

Professor Emeritus: M. E. Voland; *Associate Professors:* S. K. Garber, S. C. Lilley; *Assistant Professor:* T. J. Hoban.

ANTHROPOLOGY TEACHING AND RESEARCH

Associate Professor J. M. Wallace, *Coordinator*

Associate Professors: G. S. Nickerson, I. Rovner, M. L. Walek; *Associate Professor Emeritus:* J. G. Peck; *Assistant Professor:* R. S. Ellovich.

SOCIAL WORK TEACHING AND RESEARCH

Associate Professor W. C. Peebles-Wilkins, *Director*

Professor: R. N. Reid; *Associate Professor:* W. C. Peebles-Wilkins; *Associate Professor Emeritus:* I. E. Russell; *Assistant Professor:* J. S. Brown, L. A. Smith; *Lecturer:* L. R. Williams.

The Department of Sociology, Anthropology and Social Work offers introductory and advanced courses in sociology, anthropology, and social work covering the major sub-fields of the three disciplines. It also offers supervised field work and practicum experiences required for certain curricula in the department.

Aims of the departmental offerings are: (1) To provide majors with academic background and experience useful for many careers in government and industry or for pursuing advanced academic work (for a description of the graduate degrees offered by the department, see the NCSU Graduate Catalog) and (2) To provide service courses to students in other curricula and to students in the Division of Continuing Education.

The department, jointly administered by the Colleges of Humanities and Social Sciences and Agriculture and Life Sciences, offers eight undergraduate curricula. The five curricula administered by the College of Humanities and Social Sciences are: Bachelor of Arts in sociology, Bachelor of Arts in sociology with criminal justice option, Bachelor of Arts in sociology with social studies teacher education option, Bachelor of Arts in sociology with anthropology concentration, and Bachelor of Social Work.

OPPORTUNITIES

A wide variety of jobs is open to the graduates of this department.

Both public and private firms employ sociologists in policy development and decision-making. Sociology graduates are also employed as research evaluators and sales personnel.

Sociology graduates with the criminal justice option have additional opportunities in law-enforcement field. Similarly, graduates with social studies teacher education option have additional opportunities in public and private schools while the graduates with anthropology concentration have the option to pursue graduate studies in anthropology.

Students graduating with Bachelor of Social Work degree are employed as social workers in public and private social work organizations. Fields of employment include public welfare agencies, family and children's agencies, hospitals, school systems, mental health services, correctional programs, community-centers, rehabilitation agencies, and services to the aged.

BACHELOR OF ARTS IN SOCIOLOGY

The following departmental requirements must be met by all students majoring in sociology: A minimum of 31 hours in the major field including SOC 300, Social Research Methods; SOC 400, Theories of Social Structure; SOC 401, Theories of Social Interaction; at least three, but no more than six, credit hours of 200 level sociology courses; at least 15 credit hours of 400 level or above sociology courses including SOC 400 and SOC 401. (Note: In the LCS program [anthropology concentration], 3 credit hours at the 400 level or above are in anthropology.) Additional electives in sociology may be at the 300 level or above. ANT 252, Cultural Anthropology, is required. A second course in anthropology is strongly recommended. One course in statistics is also required.

Criminal Justice Option—The criminal justice option seeks to develop a professional orientation that will be relevant both to occupational goals and participation as a citizen in community affairs. Courses in both political science and sociology are included in a 28-hour block that provides a general background in crime causation and agencies of criminal justice plus the opportunity to select from more specific courses dealing with deviance, juvenile delinquency, the court system, correctional facilities, and the like, including field placement in an agency of the criminal justice system.

Social Studies Teacher Education Option—This curriculum prepares the student for state certification in social studies in the secondary school system. (132 credit hours required for graduation.) The inclusion of a professional semester with practice teaching and the need for a broad base in the social sciences makes this a comparatively demanding program with somewhat less opportunity for free electives. Courses in education and psychology are taken beginning in the sophomore year in preparation for the teaching experience. The student learns the basic concepts of economics, political science, anthropology and history, as well as sociology. Enrollments in Teacher Education Option programs may be limited.

Anthropology Concentration—This concentration emphasizes the complementary nature of sociology and anthropology in understanding human behavior in social and cultural context. It encourages flexibility in selection from both anthropology (12 hours within the major plus 6 hours in the social science requirement) and sociology (22 hours) courses. The four anthropological subdisciplines of cultural anthropology, physical anthropology, archaeology, and linguistics are represented in the course offerings.

BACHELOR OF SOCIAL WORK

The curriculum is accredited by the Council on Social Work Education and prepares students for the professional practice of social work in a variety of social welfare agencies, organizations, and programs designed to enrich the quality of life and to improve social functioning of people served. Study will include the social, economic, and political processes involved in the development and change of social welfare institutions, the dynamics of

human behavior and the interventive methods and their application to a variety of situations and clients. Thirty-three hours of class and field instruction in social work, plus specified courses in the social sciences, the humanities, and natural sciences are required. Graduates receive the B.S.W. degree and are certifiable under North Carolina law.

MINOR IN ANTHROPOLOGY

A minor in anthropology focuses on the comparative study of human beings, with emphasis on both the physical and cultural aspects. A flexible selection of courses (15 credit hours) includes offerings from anthropological subdisciplines such as cultural anthropology, physical anthropology, archaeology, and linguistics.

MINOR IN SOCIAL WORK

The minor is designed to familiarize the student with the social service system, major social welfare programs, and elements of the profession of social work. The student will take five required courses and select one additional course from elective offerings which present the contribution of professional social work in a number of settings.

MINOR IN SOCIOLOGY

This minor emphasizes sociological theory and research with substantive applications. The minor builds on theory and methodology and allows students flexibility in the choice of subdisciplines such as criminology, stratification, democraphy, social psychology, race and ethnic relations, or the family.

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

Cox Hall (Rooms 113-122)

J. L. Whitten, *Dean*

R. D. Bereman, *Associate Dean for Academic Affairs*

R. E. Fornes, *Associate Dean for Research*

R. G. Savage, *Assistant Dean for Academic Affairs*

W. P. Hill, *Coordinator for African-American Affairs and PAMS Undeclared Program*

The College of Physical and Mathematical Sciences offers students whose interests lie in the basic science and mathematical areas, programs of study and research at both the graduate and undergraduate level that lead to many exciting career opportunities. In addition, the College provides the core science and mathematical education support for the entire university. The College consists of six academic departments: Biochemistry, Chemistry, Marine, Earth and Atmospheric Sciences, Mathematics, Physics, and Statistics. The Center for Research in Scientific Computing, The Institute of Statistics, the Natural Resources Research Center, the Precision Engineering Center, the Center for Advanced Electronic Materials Processing, the microelectronics research activities, and the new biotechnology research activities are also associated in part with the College.

Graduates of the College are recruited for technical and administrative positions in industrial research and development laboratories, universities and colleges, non-profit research organizations and government agencies. A large percentage of the graduates undertake advanced study in medical or other professional schools as well as further study leading to the Master of Science and Doctor of Philosophy degrees.

The high school student who enjoys computers, mathematics, chemistry, the geosciences, or physics and who has an interest in natural phenomena and their fundamental descriptions, should consider the career opportunities in the physical and mathematical sciences. Students in the College consistently perform very well as undergraduates; approximately one-third of the students graduate with honors.

FACILITIES

Each department in the college utilizes a number of highly specialized research facilities. These range from highly specialized laboratories such as those in solid state physics or nuclear magnetic resonance spectroscopy to state-of-the-art instruments such as X-ray diffractometers and electron spin resonance spectometers. These laboratories are routinely utilized by advanced undergraduates taking part in research programs. In addition, each department maintains up-to-date computer laboratories and each has access to the CRAY YMP super computer in the Research Triangle Park. Again, these facilities are utilized not only for graduate research but for undergraduate research and instruction. A detailed list of specialized equipment is available upon request for each department.

TUTORIAL AND AUDIO-VISUAL ASSISTANCE

Most of the departments in PAMS offer students some form of free tutorial assistance, and several departments provide facilities for students to use supplementary videotaped or computer-assisted instructional materials on a voluntary basis.

CURRICULA

The College offers undergraduate programs of study leading to the Bachelor of Science degree with a major in chemistry, geology, mathematics, meteorology, physics or statistics.

These curricula have similar freshman years, enabling a freshman to change, without loss of time, from one department to another in the College. In addition, the College offers programs of study leading to the Bachelor of Arts degree with a major in geology or chemistry. A one year general program (PMU) is offered to students who want to major in one of these curricula but have not yet made a decision. Minors are offered in geology, mathematics, meteorology, physics and statistics.

PREMEDICAL SCIENCES

Medical and dental schools as well as many other health-related professional schools have long regarded degree programs in the core physical and mathematical sciences as excellent "pre-professional" curricula. Some professional schools prefer the in-depth knowledge gained by this route over those curricula which offer a cursory view of a variety of topics. For further details, contact Dr. Robert Bereman, Associate Dean for Academic Affairs, or Dr. Marion Miles, College of Physical and Mathematical Sciences Pre-Professional Adviser.

SHORT COURSES AND INSTITUTES

Several short courses and specialized institutes are offered throughout the academic year and during the summer months in chemistry, geology, mathematics, physics, and statistics for high school and college faculty. For information, write the associate dean of the school.

In addition, certain regular courses may be taken for credit through correspondence or evening classes through the Division of Continuing Education in Raleigh, Charlotte, or the Greensboro-Burlington-Winston-Salem area. For information write North Carolina State University Division of Lifelong Education, Raleigh.

SCHOLARS AND HONORS PROGRAMS

Exceptional students may be selected to participate in the University Scholars Program of the College of Physical and Mathematical Sciences (PAMS). Enriched courses in chemistry, English, mathematics, and physics have been developed specifically for program participants. At the beginning of the junior year, promising students may select special courses, and begin to participate in undergraduate research and honors programs, for which they may receive some graduate credit toward the Master of Science degree during the senior year.

Well-prepared students entering the College may seek advanced placement in biology, chemistry, computer science, foreign language, history, mathematics, or physics by passing qualifying examinations.

STUDENT ACTIVITIES

In addition to university-wide extracurricular activities and honor organizations, the College of Physical and Mathematical Sciences has student chapters of the following professional and honor organizations: Society of Physics Students, Pi Mu Epsilon, the American Chemical Society, Mu Sigma Rho, American Meteorology Society, American Institute of Mining Engineers (Geology Club), and the nation's first chapter of the Society of Black Physical and Mathematical Scientists.

The PAMS Council, composed of elected students from the college, sponsors and participates in a wide variety of technical and social activities.

GRADUATE STUDY

The Master of Science degree is available with a major in biochemistry; biomathematics; chemistry; marine, earth, and atmospheric sciences; mathematics; applied mathematics; statistics; and physics. The Master of Biomathematics, Master of Chemistry, and the Master of Statistics are also offered. A new jointly administered Master of Arts in Liberal Studies (MALS) program with the College of Humanities and Social Sciences is also available. The Doctor of Philosophy degree is available in biochemistry, biomathematics,

chemistry, marine, earth, and atmospheric sciences, mathematics, applied mathematics, statistics, and physics.

BIOCHEMISTRY

(See Agriculture and Life Sciences)

CHEMISTRY

Dabney Hall (Room 108) and Withers Hall

Professor K. W. Hanck, *Head of the Department*

Professor W. P. Tucker, *Assistant Head for Undergraduate Studies*

Professor M. L. Miles, *Assistant Head for Business Affairs*

Professor R. J. Linderman, *Graduate Administrator*

Alumni Distinguished Undergraduate Professors: F. C. Hentz, W. P. Tucker

Professors: R. D. Bereman, E. F. Bowden, L. H. Bowen, C. L. Bumgardner, H. H. Carmichael, D. L. Comins, L. D. Freedman, F. W. Getzen, F. C. Hentz, Jr. (*Director of General Chemistry*), Z Z. Hugus, Jr., L. A. Jones, S. G. Levine, G. G. Long, C. G. Moreland, A. F. Schreiner, L. B. Sims, E. O. Stejskal, G. H. Wahl, Jr. (*Director of Organic Chemistry*), M. Whangbo, J. L. Whitten; *Professors Emeriti:* G. O. Doak, R. H. Loeppert, W. A. Reid, P. P. Sutton, R. C. White; *Associate Professors:* C. B. Boss, T. C. Caves, A. F. Coots, Y. Ebisuzaki, S. T. Purrington, W. L. Switzer, D. W. Wertz; *Associate Professor Emeritus:* T. M. Ward; *Assistant Professors:* M. G. Khaledi, H. H. Thorp, R. B. van Breemen; *Assistant Professors Emeritus:* T. J. Blalock, W. R. Johnston; *Instructor:* W. S. Smith; *Instructor Emeritus:* G. M. Oliver; *Laboratory Supervisors:* R. D. Beck, H. Gracz, G. L. Hennessee, J. C. Le, S. S. Sankar, G. Shaw, J. T. Sigvaldsen, P. Singh; *Laboratory Demonstrator:* M. L. Benevides; *Teaching and Research Technicians:* M. C. Bundy, D. E. Knight.

Chemistry is the science dealing with the composition, structure, and properties of all substances and changes that they undergo. Chemists have contributed to the synthetic fiber industry, petroleum products and fuels, plastics, the food processing industry, nuclear energy, electronics, modern drugs and medicine. Today's chemists are concerned with the fundamental building blocks of all materials—atoms and molecules—leading to improvement of old materials, development of substitutes or new ones, and an understanding of our material environment.

OPPORTUNITIES

The chemical industry is the nation's largest manufacturing industry. Chemists comprise the largest proportion of scientists in the United States, and future demand for chemists should continue to grow. A variety of jobs are open to the chemist: biochemistry and other biological areas, education, medicine, law, metallurgy, space science, oceanography, sales or management, pure research and development. Chemists are employed in every field based on modern technology; opportunities for chemists in the field of education are many and varied.

BACHELOR OF SCIENCE IN CHEMISTRY

The curriculum, accredited by the American Chemical Society, includes a strong, broad background in mathematics, physics and the liberal arts. The basic areas of organic, physical, inorganic and analytical chemistry are stressed. Laboratory and classroom work develop the skills, knowledge and inquiring spirit necessary for a successful career in chemistry. The advised elective credits allow individual diversity at the junior and senior

levels. Many undergraduates participate in current departmental research through part-time employment or senior research projects. This curriculum prepares the student to enter the job market directly as a chemist or to enter various professional schools or graduate school in chemistry or an allied science. This route is also an excellent premedical program.

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 107 Principles of Chemistry	4
CH 106 Computer Appl. Chem. I	1	CH 108 Computer Appl. Chem. II	1
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
MA 141 Analytic Geometry & Calc. I	4	MA 241 Analytic Geometry & Calc. II	4
PE 100 Health & Physical Fitness	1	PY 205 Physics for Engr. & Sci. I[2]	4
Humanities/Social Science Elective[1]	3	Physical Education Elective	1
	16		17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 221 Organic Chemistry I	4	CH 211 Analytical Chemistry I	3
MA 242 Analytic Geometry & Calc. III	4	CH 223 Organic Chemistry II	4
PY 208 Physics for Engr. & Sci. II[2]	4	MA 341 Applied Differential Equations I	3
Humanities/Social Science Elective[1]	3	English Elective (Literature)	3
Physical Education Elective	1	Humanities/Social Sciences Elective[1]	3
	16	Physical Education Elective	1
			17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 401 Syst. Inorganic Chemistry I	2	CH 403 Systematic Inorganic Chemistry II	3
CH 402 Inorganic Chemistry Lab	1	CH 433 Physical Chemistry II	3
CH 428 Qualitative Organic Analysis	3	CH 434 Physical Chem. Lab	2
CH 431 Physical Chemistry I	3	ENG 333 English for Sci. & Res. *or*	
FL 101 Elementary Language[3]	3	Communication Elective	3
Advised Elective[4]	3	FL 102 Elementary Language[3]	3
	15	Advised Elective[4]	3
			17

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 415 Analytical Chemistry II	3	Advised Elective[4]	3
CH 416 Analytical Chemistry Lab	2	Humanities/Social Science Elective[1]	3
CH 435 Intro. Quantum Chemistry[2] *or*		Free Electives	9
PY 407 Intro. Modern Physics[2]	3		15
Advised Elective[4]	3		
Humanities/Social Science Elective[1]	3	Minimum Hours Required for Graduation	130[5]
Free Elective	3		
	17		

[1]These credits should be distributed approximately equally between the humanities (fine arts, history, literature, languages, philosophy and religion) and the social sciences (anthropology, economics and business, political science, psychology and sociology).

[2]The sequence PY 201, 202, 203 may be substituted for PY 205, 208, 407 or (CH 435) with approval of the advisor.

[3]German (FLG) is recommended but French, Japanese, Russian and Spanish are acceptable.

[4]Advised electives are designed to allow students to concentrate in an area or field of their choice. Courses to fulfill this requirement are selected by students after consultation with their advisors or the coordinator of advising. No more than four hours of the advised electives should be in introductory courses, i.e., courses having no university prerequisites.

[5]D grades are **not** accepted in the following courses: CH 101, CH 107, CH 211, CH 221, CH 223, CH 431, CH 433, ENG 111, ENG 112, MA 141, MA 241, MA 242, PY 205.

BACHELOR OF ARTS IN CHEMISTRY

The B.A. program offers a much more flexible course of studies for students who do not plan to become professional chemists but who desire an interdisciplinary program with an emphasis on chemistry. The proper choice of electives will prepare the graduate for one of the following: medical or dental school, work in chemical sales and management, teaching in secondary schools, work in environmental science, or graduate school in an allied science.

Nationally many premedical students are in a B.A. chemistry program. Since the first year is essentially identical to that of the B.S. program, students may enter the B.A. program either directly from high school or at the end of their first year.

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry	4	CH 107 Principles of Chemistry	4
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
MA 141 Analytic Geometry & Calc. I	4	MA 241 Analytic Geometry & Calc. II	4
PE 100 Health & Physical Fitness	1	PY 205 Physics for Engr. & Sci. I	4
Humanities/Social Science Elective	3	Physical Education Elective	1
	15		16

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 221 Organic Chemistry I	4	CH 223 Organic Chemistry II	4
PY 208 Physics for Eng. & Sci. II	4	Humanities/Social Science Elective[1]	3
Humanities/Social Science Electives[1]	6	Science Elective	4
Physical Education Elective	1	Free Elective	3
	15	Physical Education Elective	1
			15

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 331 Introductory Phys. Chem.	4	CH 315 Quantitative Analysis	4
Humanities/Social Science Electives[1]	6	Advised Elective[2]	4
Science Elective	4	Humanities/Social Science Elective[1]	6
Free Elective	3	Free Elective	3
	17		17

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 401 Systematic Inorg. Chem. I	2	BCH Introductory Biochem.	3
Advised Electives[2]	8	Advised Electives[2]	6
Humanities/Social Science Elective[1]	3	Humanities/Social Science Elective[1]	3
Free Elective	3	Free Elective	4
	16		16

Minimum Hours Required for Graduation .....127[3]

Because of the inherent flexibility of the B.A. curriculum in chemistry, students entering into the program must work closely with their faculty adviser in selecting an area of concentration outside the major, based upon their career or postgraduate goals.

[1] Thirty hours of humanities and social science courses are required with a minimum of 12 hours each of humanities and social sciences. The remaining 6 hours may come from humanities or social science courses, including Multidisciplinary Studies and Arts Studies courses.

[2] Advised electives are designed to allow the students to concentrate in areas related to academic or career goals. Because of the inherent flexibility of the B.A. curriculum in chemistry, students entering into the program must work closely with their adviser in selecting an area of concentration outside the major, based upon their career or post-graduate goals.

[3] D grades are not accepted in the following courses: CH 101, CH 107, CH 221, CH 223, CH 315, CH 331; MA 141, PY 205, ENG 111, and ENG 112.

COMPUTER SCIENCE

(See College of Engineering.)

MARINE, EARTH, AND ATMOSPHERIC SCIENCES

Jordan Hall (Room 1125)

Professor L. J. Pietrafesa, *Head of the Department*

Associate Professor E. F. Stoddard, *Associate Department Head and Undergraduate Administrator*

Distinguished University Scholar: T. F. Malone

Alumni Distinguished Undergraduate Professor: V. V. Cavaroc, Jr.

Professors: C. E. Anderson, S. P. S. Arya, V. V. Cavaroc, Jr., J. M. Davis, D. J. DeMaster, R. V. Fodor, G. S. Janowitz, D. L. Kamykowski, S. Raman, V. K. Saxena, C. W. Welby, T. G. Wolcott; *Visiting Professors:* T. S. Hopkins, C. N. K. Mooers, C. S. Ramage; *Adjunct Professors:* E. G. Bolen, G. Briggs, W. J. Cleary, B. Dimitriades, D. F. Kapraun, D. G. Lindquist, R. V. Madala, R. K. Sizemore, W. H. Snyder, D. D. Willey, V. A. Zullo; *Professors Emeriti:* H. S. Brown, L. J. Langfelder, C. J. Leith, J. M. Parker, III, W. J. Saucier; *Associate Professors:* M. G. Bevis, M. M. Kimberley, C. E. Knowles, L. A. Levin, J. M. Morrison, A. J. Riordan, F. H. M. Semazzi, W. J. Showers, G. F. Watson; *Research Associate Professor:* Viney Aneja; *Visiting Associate Professors:* M. L. Kaplan, D. L. Wolcott; *Adjunct Associate Professors:* S. Chang, R. M. Dillaman, R. K. M. Jayanty, C. A. Nittrouer, R. D. Roer, G. W. Thayer, R. H. Weisberg; *Assistant Professors:* N. E. Blair, S. Businger, J. P. Hibbard, E. L. Leithold, Y-L. Lin, P-T. Shaw, S. W. Snyder, J. A. Speer; *Research Assistant Professor:* D. E. Checkley; *Visiting Assistant Professors:* F. H. Proctor, H. Yamazaki; *Adjunct Assistant Professors:* T. B. Curtin, M. DeMaria, J. C. Reid; *University Distinguished Scholar:* T. F. Malone; *Scholar in Residence:* R. Braham.

The Department of Marine, Earth and Atmospheric Sciences provides instruction in three complementary disciplines whose concerns are the solid earth, the oceans upon it, and the atmosphere extending upward from its surface. Courses, curricula, and research programs in the department deal with many aspects of two very important human concerns: natural resources and environmental sciences. The department awards the B.A. degree in geology; a B.S. degree in geology with options either in traditional geology or in geophysics; and a B.S. degree in meteorology. Degrees in Marine Science are offered only at the graduate level. (Consult the Graduate Catalog for information pertaining to graduate degrees offered.)

Geology (Earth Science) is the study of the solid earth. It can be subdivided into four interrelated areas: rocks and minerals (mineralogy, petrology, and ore deposits); nature and behavior of earth materials (structural geology, geophysics, geochemistry, and geomorphology); earth history (historical geology, stratigraphy, tectonics and paleontology); and the earth's influence upon humanity (engineering, petroleum, economic and environmental geology and hydrogeology). Instruction within the geology degree programs includes course work in each of these areas. The geophysics option includes a core of basic geology courses, but in addition provides a thorough grounding in geophysics and related sciences. The program involves more coursework in physics, mathematics and computer science than does the traditional Geology B.S. Geophysics applies these quantitative sciences to an understanding of earth, including its deep interior. This is accomplished through the measurement and interpretation of earth's physical properties (e.g. magnetic, electric, gravity, seismic) at all scales.

Geologists and geophysicists apply scientific techniques to solve those problems in nature that will result in a better understanding and utilization of our environment and natural resources. Geologic and geophysical principles are used (1) to discover, evaluate, develop and conserve our natural resources (oil, coal, water and metals), (2) to find solutions to problems related to disposal of liquid and solid wastes, (3) in determining the geologic settings for highways, dams, tunnels, and power plants and (4) to help prevent or alleviate the consequences of natural disasters such as earthquakes, floods, volcanic eruptions, dam failures, and highway collapse.

Meteorology (Atmospheric Science) is the study of all aspects of the behavior and phenomena of the atmosphere, including its interactions with earth's land and sea surfaces and with the solar atmosphere. Its objective is to apply an understanding of the atmosphere to the benefit of humanity.

Few activities on earth are unaffected by the natural conditions and processes of our atmospheric environment. The most familiar purpose of meteorology is in providing weather reports, warnings, and forecasts which are essential to aviation, shipping, agriculture, solar and wind energy utilization, outdoor recreation and to the protection of humans from weather hazards and damage. Meteorology is applied to the understanding and alleviation of other environmental concerns such as air pollution, acid rain, and weather modification. The concern about environmental quality has led to expanded efforts in atmospheric modeling and monitoring, research applied to industrial operations, environmental planning and governmental regulation. Basic subdivisions in the field of meteorology are synoptic and dynamic, boundary layer, air pollution, and agricultural meteorology; cloud and aerosol physics; and climatology.

Oceanography (Marine Science) is primarily taught at the graduate level (see Graduate Catalog). The department does offer two introductory courses at the undergraduate level. One of these (MEA 200) provides a survey of the marine science field; the other (MEA 220) is a survey of marine biology. The department also offers several beginning graduate level courses for senior level undergraduate students. Students interested in pursuing a graduate program in marine science may wish to enroll in these courses as electives. A strong undergraduate foundation in one of the basic sciences or in engineering is needed before a student concentrates in marine related fields. Therefore, graduate students in marine science are drawn from undergraduate programs in biology, chemistry, engineering, geology, mathematics, meteorology or physics.

OPPORTUNITIES

The problems involving energy and mineral resources and the environment are complex and will not likely yield to easy or quick solutions. Geologists and geophysicists are currently employed by environmental and geotechnical consulting firms, oil and coal companies, mining and quarrying concerns, mineral exploration companies, construction firms, cement companies, and railroads; coastal and forest service agencies; schools, colleges, museums and research institutions; and city, state and federal agencies (e.g. D.O.E., U.S.G.S., N.A.S.A., and E.P.A.).

Meteorological and oceanographic services are provided by federal government agencies, primarily the National Oceanic and Atmospheric Administration and components of the Department of Defense. This work may involve atmospheric and oceanic sensing and measurement, including the use of satellites and space probes; data analysis and computation; weather forecasting, and guidance services to aeronautics, defense and public safety agencies, agriculture, forestry, hydrology, recreation and public health. Meteorologists are involved in environmental planning and regulation at the state and local levels. Power generation and fuel transmission industries, engineering firms, environmental consulting firms, insurance companies, major retailing businesses, as well as schools, colleges and research institutions employ meteorologists because of recognition of the involvement of the atmosphere in their activities.

FACILITIES

The Department of Marine, Earth and Atmospheric Sciences maintains an extensive inventory of both laboratory and field research equipment and facilities. The department has use of the R/V Cape Hatteras, a 135 ft. coastal zone research vessel. Specialized equipment available in the department include an X-ray fluorescence spectrometer, an automated X-ray diffractometer, neutron activation analysis equipment, geophysics instruments; (e.g., gravimeter, magnetometer, and seismic reflection equipment), radioisotope and stable isotope analytical equipment, a phytotron, an interactive satellite information processing system (McIDAS), CTD and hydrographics sampling systems and deep and shallow water moored instrumentation. Some of the specialized laboratories that are available in the department include an electron microprobe laboratory, sedimentology lab (microcomputer controlled grain-size analyzer) cloud-aerosol interaction lab, planetary boundary-layer lab, weather analysis and forecasting lab; a weather observatory including DIFAX, FAA 604, and satellite image receiving services, rooftop weather-monitoring and

balloon-launch platforms; and severe storm and mesoscale research labs. The department also houses the Office of the State Climatologist. In addition to numerous microcomputers, the department maintains a VAX minicomputer with associated graphics devices and remote terminals in departmental labs and offices.

CURRICULA IN MARINE, EARTH AND ATMOSPHERIC SCIENCES

The B.A. and B.S. degree programs in geology require the same geology courses, but differ in their content of social science-humanities, mathematics, and collateral physical sciences. The B.A. program is designed to be similar to a B.S. degree in geology obtained from other universities, while the B.S. program is more technically oriented, and similar to other curricula in the physical sciences at NCSU. The B.S. degree program in meteorology also follows the pattern of physical sciences curricula.

BACHELOR OF ARTS IN GEOLOGY

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
MA 131 Analytic Geometry & Calc. A	4	MA 231 Analytic Geometry & Calc. B	3
MEA 101 Geology I: Physical	3	MEA 102 Geology II: Historical	3
MEA 110 Geology I Lab	1	MEA 111 Geology II Lab	1
Humanities/Soc. Sci. Elective[1]	3	Humanities/Soc. Sci. Elective[1]	3
PE 100 Health & Physical Fitness	1	Physical Education Elective	1
	15		14

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 103 General Chemistry II	4
MEA 330 Crystallography & Mineralogy	3	MEA 440 Igneous & Metamorphic Petrology	4
MEA 331 Optical Mineralogy	2	ST 311 Intro. to Statistics	3
Computer Science Option[2]	2-3	Humanities/Soc. Sci. Elective[1]	3
Humanities/Soc. Sci. Elective[1]	3	Physical Education Elective	1
Physical Education Elective	1		15
	15-16		

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENG 333 Commun. for Sci. & Res.[4]	3	MEA 451 Structural Geology	4
MEA 450 Sediment Petrology & Stratigraphy	4	PY 212 General Physics	4
PY 211 College Physics I	4	COM (SP) 110 Public Speaking	3
Humanities/Soc. Sci. Elective[1]	3	Humanities/Soc. Sci. Elective[1]	3
Free Elective	3	Free Elective	3
	17		17

SUMMER SESSION

MEA 465, 466 Geologic Field Camp I, II 6

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MEA 468 Invert. Paleontology & Biostratigraphy	4	MEA 491 Senior Seminar	2
Earth Science Elective[3]	3	Earth Science Elective[3]	3
Earth Science Elective[3]	3	Humanities/Soc. Sci. Electives[1]	3
Humanities/Soc. Sci. Elective[1]	3	Humanities/Soc. Sci. Electives[1]	3
Free Elective	3	Free Electives	3
	16		14

Minimum Hours Required for Graduation 129

[1]A course in each of at least three humanities (*e.g.* fine arts, history, literature, language, philosophy, religion) and in each of at least three social sciences (*e.g.* anthropology, economics, political science, psychology, sociology). At least nine hours must come from courses beyond the introductory level.
[2]Computer Science Option to be selected from among CSC 101, CSC 111, and CSC 200.
[3]Earth Science Electives are above the 300 level.
[4]ENG 331 or ENG 332 may be substituted for ENG 333.

BACHELOR OF SCIENCE IN GEOLOGY

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 103 General Chemistry II	4
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
MA 141 Analytic Geometry & Calc. I	4	MA 241 Analytic Geometry & Calc. II	4
MEA 101 Geology I: Physical	3	MEA 102 Geology II: Historical	3
MEA 110 Geology I Lab	1	MEA 111 Geology II Lab	1
PE 100 Health & Physical Fitness	1	Physical Education Elective	1
	16		16

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 242 Analytic Geometry & Calc. III	4	MEA 440 Igneous & Metamorphic Petrology	4
MEA 330 Crystallography & Mineralogy	3	PY 205 Physics Engrs. & Scient. I	4
MEA 331 Optical Mineralogy	2	Social Science Elective	3
Computer Science Option[1]	2-3	Statistics Option[2]	3
Social Science Elective	3	Physical Education Elective	1
Physical Education Elective	1		15
	15-16		

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENG 333 Commun. for Sci. and Res.[7]	3	MEA 451 Structural Geology	4
MEA 450 Sediment Petrology & Stratigraphy	4	COM (SP) 110 Public Speaking	3
PY 208 Physics Engrs. & Scient. II	4	Math/Science Option[3]	3-4
Humanities Elective	3	Philosophy/History Sci. Option[4]	3
Free Elective	3	Free Elective	3
	17		16-17

SUMMER SESSION

MEA 465, 466 Geologic Field Camp I, II 6

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MEA 468 Invert. Paleontology & Biostratigraphy	4	MEA 491 Senior Seminar	2
Earth Science Elective[5]	3	Earth Science Elective[5]	3
Humanities/Social Science Elective	3	Humanities/Social Science Elective	3
Technical Elective A[6]	3-4	Technical Elective B[6]	3
Free Elective	3	Free Elective	3
	16-17		14

Minimum Hours Required for Graduation 131

[1]Computer Science Option to be selected from among CSC 101, CSC 111, and CSC 200.
[2]Statistics Option to be selected from among ST 301, ST 361, and ST 371.
[3]Math/Science Option to be selected from among CH 220, 221, 315, 331, 431; MA 305, 341, 421; PY 407; MAE 301; CSC 302; CE 213; ST 302.
[4]Philosophy/History of Science Option to be selected from among PHI 340, HI 321, HI 322, and MDS (UNI) 301.
[5]Earth Science Electives are above the 300 level.
[6]Technical Elective is a paired two-course sequence in a related field. Examples include: Physics (*e.g.* PY 411 and 412; PY 407 and 441); Astronomy (*e.g.* PY 223 and 240); Biological Sciences (*e.g.* BO 200 and 360; BS 100 and ZO 220); Civil Engineering (*e.g.* CE 214 and 215; CE 201 and 213); Soil Science (*e.g.* SSC 200 and SSC 361); Economics (*e.g.* EB 201 and 202); Anthropology (*e.g.* ANT 251 and 253); Computer Science (*e.g.* CSC 201 and 202); Chemistry (*e.g.* CH 331 and 401; CH 223 and 428, provided CH 221 has been taken to fulfill the Math/Science Option requirement); Mathematics (*e.g.* MA 225 and 403); Statistics (*e.g.* ST 302 and 432 or ST 372 and 432, provided ST 301 or ST 371 have been used to fulfill the Statistical Science Option requirement); Meteorology (*e.g.* MEA 130 and 311); Marine Science (*e.g.* MEA 200 plus any one of MEA 220, 510, 560, or 571). Courses used to fulfill other requirements may not be applied to the Technical Elective requirement.
[7]ENG 331 or ENG 332 may be substituted for ENG 333.

MINOR IN GEOLOGY

The Department of Marine, Earth and Atmospheric Sciences offers a Minor in Geology to majors in any field except geology (GYA, GYS, and GPY). Admission to the program requires a grade of C or better in MEA 110 and either MEA 101 or MEA 120. Successful

completion of the program requires a grade of C or better in at least 15 hours of geology courses beyond the first semester including at least two lab courses. Contact department for information.

GEOPHYSICS OPTION, BACHELOR OF SCIENCE IN GEOLOGY

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 105 Chemistry Princ. & Appl.	3
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
MA 141 Analytic Geometry & Calc. I	4	MA 241 Analytic Geometry & Calc. II	4
MEA 101 Geology I: Physical	3	PY 201 University Physics I[1]	4
MEA 110 Geology I Lab	1	Physical Education Elective	1
PE 100 Health & Physical Fitness	1		15
	16		

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CSC 111 Intro. FORTRAN	2	CSC 302 Numerical Methods	3
MA 242 Analytic Geometry & Calc. III	4	MA 341 Applied Diff. Equations I	3
MEA 329 Elements of Crystal. & Mineralogy	2	MEA 439 Elements of Igneous & Meta. Petro.	3
PY 202 University Physics II[1]	4	PY 203 University Physics III[1]	4
Humanities Elective	3	Humanities Elective	3
Physical Education Elective	1	Physical Education Elective	1
	16		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 401 Applied Diff. Equations II	3	MEA 451 Structural Geology	4
MEA 450 Sed. Petrol. & Stratig.	4	ST 361 Intro. Statistics	3
MEA 470 Intro. Geophysics	3	Social Science Elective	3
PY 411 Mechanics I	3	Earth Science Elective	3
Social Science Elective	3	Free Elective	3
	16		16

SUMMER SESSION

MEA 475 Geophysical Field Methods 2

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MEA 471 Exploration Geophysics	3	MEA 476 Seismic Exploration for Oil	3
PY 414 Electricity & Magnetism I	3	Earth Science Elective[3]	3
Geophysics Elective[2]	3	Humanities/Soc. Sci. Elective	3
Humanities/Soc. Sci. Elective	3	Technical Elective[4]	3
Free Elective	3	Free Elective	3
	15		15

Minimum Hours Required 128

[1]Students transferring into the program may substitute PY 205, 208, 407 for the sequence PY 201, 202, 203.
[2]Geophysics elective to be chosen from MEA 415, 461, or 523.
[3]Recommended that GPY students take MEA 491.
[4]Technical elective constitutes a minor field of emphasis. Among those recommended, are physics (PY 412, 413, 415), math (MA 405, 427-428, 501).

BACHELOR OF SCIENCE IN METEOROLOGY

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 105 Chemistry—Princp. & Appl.[1]	3
ENG 111 Composition and Rhetoric	3	ENG 112 Composition and Reading	3
MA 141 Analytic Geometry and Calc. I	4	MA 241 Analytic Geometry & Calc. II	4
PE 100 Health & Physical Fitness	1	PY 205 Physics Engrs. & Scient. I	4
Social Science Elective	3	Physical Education Elective	1
	15		15

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 242 Analytic Geometry & Calc. III	4	MA 341 Applied Diff. Equa. I	3
MEA 311 Physical Climatology	3	MEA 312 Physical Meteorology	3
MEA 313 Meteorology Lab I	1	MEA 314 Meteorology Lab II	1
PY 208 Physics Engrs. & Scient. II	4	Approved Elective[5]	3
Social Science Elective	3	Geophysical Sciences Elective[2]	3
Physical Education Elective	1	Humanities Elective	3
	16	Physical Education Elective	1
			17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CSC 111 Intro. to FORTRAN Program	2	MEA 405 Climatological Data Analysis	3
MEA 421 Atmospheric Dynamics I	4	MEA 412 Atmospheric Physics	3
ST 361 Intro. Statistics	3	MEA 422 Atmospheric Dynamics II	4
Approved Elective[5]	3	Communicative Arts Elective[3]	3
Communicative Arts Elective[3]	3	Free Elective	3
Humanities Elective[4]	3		16
	18		

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MEA 443 Weather Anly. & Fcstg. I	3	Approved Electives[5]	6
MEA 455 Micrometeorology	3	Humanities/Soc. Sci. Elective	3
Approved Elective[5]	3	Meteorology Technical Elective[6]	3
Humanities/Social Sci. Elective	3	Free Elective	3
Free Elective	3		15
	15		

Minimum Hours Required for Graduation 127

[1]Students who intend to take additional chemistry courses, or who plan technical electives which require additional chemistry, should add CH 104 or replace CH 105 with CH 103 or CH 107. Advanced transfer students are permitted to substitute mathematics, science, or engineering credits for CH 105.

[2]Geophysical sciences elective is selected from among MEA 101, MEA 120-110, MEA 200, PY 223, SSC 200, CE 201 or 370, FOR 272.

[3]Two courses in a foreign language, or one course each in communication and technical writing, but see note at 4 below.

[4]If the foreign language option is selected to filfull the Communicative Arts requirement, then one Humanities Elective may be replaced with a Free Elective.

[5]Approved elective constitutes a minor field of emphasis consisting of at least 15 credits in a single discipline or related disciplines. These include, but are not limited to: biometeorology, chemistry, computer science, environmental quality, geology-geophysics, hydrology, mathematics, physics, physical oceanography, statistics; several areas of engineering, agriculture, forestry; science education; weather communication.

[6]Meteorology technical elective to be chosen from MEA 444 or MEA 556.

MINOR IN METEOROLOGY

The Department of Marine, Earth, and Atmospheric Sciences offers a Minor in Meteorology to majors in any field except meteorology. Admission to the program requires a grade of C or better in at least 15 hours of meteorology at the 300 level or above. These hours must include courses MEA 421 and MEA 422. Other courses taken should be selected in consultation with meteorology faculty. Contact department for information.

MATHEMATICS

Harrelson Hall (Room 360)

Professor R. H. Martin, Jr., *Head of the Department*

Professor J. A. Marlin, *Associate Head of the Department and Scheduling Officer*

Associate Professor D. E. Garoutte, *Assistant Head of the Department and Director of Undergraduate Instruction*

Associate Professor R. T. Ramsay, *Director of Undergraduate Programs*

Professor E. E. Burniston, *Director of Summer School*

Alumni Distinguished Undergraduate Professor: J. M. A. Danby

Professors: J. W. Bishir, S. L. Campbell, R. E. Chandler, L. O. Chung, J. M. A. Danby, J. C. Dunn, A. Fauntleroy, R. O. Fulp, R. E. Hartwig, C. T. Kelley, K. Koh, J. R. Kolb, J. Luh, L. B. Martin, C. D. Meyer, Jr., C. V. Pao, E. L. Peterson, R. J. Plemmons, M. Putcha, H. Sagan, J. F. Selgrade, M. Shearer, C. E. Siewert, M. F. Singer, E. L. Stitzinger, R. E. White; *Professors Emeriti:* J. Levine, H. V. Park, P. A. Nickel, N. J. Rose, H. E. Speece, J. B. Wilson; *Associate Professors:* M. Chu, J. D. Cohen, G. D. Faulkner, J. E. Franke, T. Lada, D. M. Latch, L. K. Norris, L. B. Page, R. T. Ramsay, J. Rodriguez, R. G. Savage, S. Schecter, R. Silber, J. W. Silverstein, D. F. Ullrich, W. M. Waters; *Associate Professor Emeritus:* H. C. Cooke, H. A. Petrea; *Assistant Professors:* H. J. Charlton, X. Garaizar, R. Haas, D. J. Hansen, G. Helminck, P. Hitczenko, A. Kheyfets, K. C. Misra, S. O. Paur, J. L. Rulla, J. S. Scroggs, S. J. Wright; *Assistant Professor Emeritus:* C. F. Lewis; *Lecturers:* E. L. Barnhardt, M. McCollum, J. E. Rohrbach, M. Schiermeier; *Associate Members of the Department:* H. van der Vaart, O. Wesler.

The undergraduate major in mathematics provides a core of basic mathematics courses along with flexible choices of electives which permit both a well-rounded education and preparation for math-related careers. Because of the current employment market (for both baccalaureate and graduate students), students are advised to give serious consideration to the applied mathematics option.

Career objectives can be directed toward employment in math-related jobs in business, industry, or government, teaching at the secondary school level, or graduate study in mathematics and/or related areas.

The Mathematics Department operates a Tutorial and Audio Visual Center. This center is one of the most advanced of its kind in the country, incorporating video systems whereby a student who has missed a particular lecture or would like to see and hear a lecture on a particular topic once again can do so. Teaching assistants of the Mathematics Department are also available in the center for tutoring services. The center also has Computer Assisted Instruction Systems which incorporate a computer with a video player. With this system, the student is able to test himself or herself. The test is graded by the computer and if the student fails the test, he or she can watch a short lecture on the relevant material.

At this time, the center has video tapes of most of our basic courses, including MA 105, MA 111, MA 114, MA 121, MA 131, MA 141, MA 241, MA 242, MA 341.

The director of the center is Professor R. G. Savage, who is recognized as being one of the leading experts in this mode of mathematics education. The center is open 11 hours a day and is located in Harrelson Hall.

HONORS AND AWARDS

The department recognizes its superior students with the following annual awards:

Hubert V. and Mary Alice Park Scholarship—An award made to an outstanding rising junior or senior in mathematics.

John W. Cell Scholarships—An award for an outstanding rising junior or senior in mathematics.

Carey Mumford Scholarship—An award to an outstanding sophomore, junior or senior in mathematics.

Levine-Anderson Award—An award for that student who has the best performance in the William Lowell Putnam Examination. (This award is not restricted to mathematics majors).

Charles N. Anderson Scholarship—An award for an outstanding sophomore in mathematics.

Charles F. Lewis Scholarship—An award for an outstanding senior who is a double major in mathematics/mathematics education.

Mrs. Roberts C. Bullock Scholarship—An award for an outstanding mathematics major who has also demonstrated an interest in the English language.

The department also has a chapter of the National Mathematical Honorary Fraternity Pi Mu Epsilon. Membership is open to those students with superior performance in mathematics courses. Professor Robert Silber is currently the faculty advisor.

MATHEMATICS CURRICULUM

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry	4	CSC 101 Intro. to Programming	3
ENG 111 Composition and Rhetoric	3	ENG 112 Composition & Reading	3
MA 141 Analytic Geometry & Calc. I	4	MA 241 Analytic Geometry & Calc. II	4
PE 100 Health & Physical Fitness	1	Intermediate Foreign Language Elective	3
History Elective	3	Advised Elective	3
	15	Physical Education Elective	1
			17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 225 Struct. Real Num. System	3	MA 341 Applied Differential Eq. I	3
MA 242 Analytic Geometry & Calc. III	4	MA 407 Intro. to Modern Algebra	3
PY 205 General Physics I	4	PY 208 General Physics II	4
Advised Elective	3	Social Sciences Elective[1]	3
Literature Elective	3	Free Elective	3
Physical Education Elective	1	Physical Education Elective	1
	18		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 405 Intro. Linear Alg. & Matrices	3	MA 421 Intro. to Probability[2]	3
MA 425 Mathematical Analysis I	3	MA 426 Mathematical Analysis II	3
Advised Elective	3	Advised Elective	3
Social Science Elective[1]	3	Humanities/Social Sciences Elective[1]	3
Free Elective	3	Free Elective	3
	15		15

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Humanities/Social Sciences Electives[1]	6	Humanities/Social Sciences Electives[1]	3
Mathematical Electives	6	Mathematical Electives	6
Free Elective	3	Free Elective	6
	15		14

Minimum Hours Required for Graduation .....126[3]

[1]Of the 18 hours required as social science electives or humanities/social sciences electives, 6 must be at the 300 level or above.

[2]If ST 371 & 372 are taken in place of MA 421, the number of hours taken as advised electives is reduced by 3.

[3]Grades of D are not accepted in any required mathematics course numbered below 400 and only one D grade is permitted in mathematics courses numbered 400 or above in the mathematics electives category. D grades are not acceptable in ENG 111 and ENG 112. At more, one D grade is acceptable among the following: CH 101, CSC 101, PY 205, PY 208, MA 421 (ST 371, ST 372).

MATHEMATICS CURRICULUM, APPLIED MATHEMATICS OPTION

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CSC 101 Intro. to Programming	3
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
MA 141 Analytic Geometry & Calc. I	4	MA 241 Analytic Geometry & Calc. II	4
PE 100 Health & Physical Fitness	1	Intermediate Foreign Language Elective	3
History Elective	3	Social Science Elective[1]	3
	15	Physical Education Elective	1
			17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 225 Struct. Real Num. Syst.	3	MA 341 Applied Diff. Equations I	3
MA 242 Analytic Geometry & Calc. III	4	MA 407 Intro. to Modern Algebra	3
PY 205 General Physics I	4	PY 208 General Physics II	4
ST 371 Intro. to Probability/Stat[2]	3	ST 372 Intro. Stat. Infer & Regres.[2]	3
Literature Elective	3	Social Science Elective[1]	3
Physical Education Elective	1	Physical Education Elective	1
	18		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 405 Intro. Linear Alg. & Matrices	3	MA 426 Mathematical Analysis II	3
MA 425 Mathematical Analysis I	3	MA 432 Mathematical Models	3
Approved Elective	3	Approved Elective	3
Science Science Elective[1]	3	Humanities/Social Science Elective[1]	3
Free Elective	3	Free Elective	3
	15		15

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Approved Elective	3	Approved Elective	3
Humanities/Social Science Elective[1]	3	Humanities/Social Science Elective[1]	3
Mathematics Elective	3	Mathematics Elective	3
Free Electives	6	Free Electives	5
	15		14

Minimum Hours Required for Graduation .....126[3]

[1]Of the 18 hours required as social science electives or humanities/social sciences electives, 6 must be at the 300 level or above.

[2]ST 371 & 372 may be replaced by MA 421, which would be more successfully handled in the junior year; in that case, an additional approved elective is required and two electives should be taken during the sophomore year.

[3]Grades of D are not accepted in any required mathematics course numbered below 400 and only one D grade is permitted in mathematics courses numbered 400 or above in the mathematics electives category. D grades are not acceptable in ENG 111 and ENG 112. At most one D grade is acceptable among the following: CH 101, CSC 101, PY 205, PY 208, MA 421 (ST 371, ST 372).

MINOR IN MATHEMATICS

The Department of Mathematics offers a minor in mathematics to majors in any field except mathematics. The minor program consists of successful completion with a grade of C or better of any five three-semester-hour courses selected from among MA 225, or MA 222, but not both, and any mathematics courses numbered 300 or above.

PHYSICS

Cox Hall (Room 105)

Professor R. R. Patty, *Head of Department*

Professor G. E. Mitchell, *Associate Department Head*

Professor C. E. Johnson, *Assistant Department Head*

Professor D. R. Tilley, *Coordinator of Advising*

University Professor: G. I. Lucovsky

Alumni Distinguished Undergraduate Professors: C. R. Gould, D. G. Haase

Professors: J. Bernholc, K. T. Chung, S. R. Cotanch, W. R. Davis, W. O. Doggett, R. E. Fornes, C. R. Gould, D. G. Haase, G. L. Hall, A. W. Jenkins, C. E. Johnson, K. L. Johnson, G. H. Katzin, F. Lado, G. Lucovsky, J. D. Memory, G. E. Mitchell, J.

R. Mowat, R. J. Nemanich, M. A. Paesler, J. Y. Park, R. R. Patty, J. S. Risley, D. E. Sayers, J. F. Schetzina, L. W. Seagondollar, D. R. Tilley.; *Adjunct Professors:* J. Narayan, J. M. Zavada; *Professors Emeriti:* J. T. Lynn, A. C. Menius, Jr., E. R. Manring, L. H. Thomas; *Associate Professors:* G. C. Cobb, J. W. Cook, M. A. Klenin, G. W. Parker, S. P. Reynolds; *Adjunct Associate Professors:* E. O. Edney, D. C. Koningsberger, J. F. Shriner, A. S. Schlachter, W. Westerveld; *Associate Professor Emeritus:* D. H. Martin; *Assistant Professor:* D. C. Ellison; *Assistant Professor Emeritus.* H. L. Owen; *Adjunct Assistant Professor:* J. W. Spence; *Associate Members of the Department:* J. M. A. Danby (Mathematics), R. M. Kolbas (ECE), L. K. Norris (Mathematics), D. L. Ridgeway (Statistics).

Physics is the fundamental science of observation, measurement and mathematical description of nature. In addition to establishing basic knowledge of physical phenomena, physics provides the foundation for modern technology. Contributions by physicists are wide ranging: discovery of elementary particles, invention and use of instruments to investigate interplanetary space, study of processes fundamental to the release of thermonuclear energy, development of lasers and solid state devices, research on the structure and interaction of nucleons, nuclei, atoms, molecules, and ions.

PROGRAMS

The Physics Department offers a program of study at the undergraduate level which provides the student with a strong fundamental background and with course options allowing deeper study of selected areas of individual interest. At the graduate level, a comprehensive fundamental preparation is followed by specialization and research in one of the following areas: atmospheric, astrophysics, atomic, nuclear, nuclear magnetic resonance, plasma, relativity and solid state physics. (See listing of graduate degrees and consult the Graduate Catalog.)

PHYSICS CURRICULUM

The undergraduate curriculum in physics provides the basic training for a career in physics or for graduate study. The curriculum leads to a Bachelor of Science in Physics.

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 107 Principles of Chemistry	4
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
MA 141 Analytic Geometry & Calc. I	4	MA 241 Analytic Geometry & Calc. II	4
PE 100 Health & Physical Fitness	1	PY 201 General Physics	4
PY 101 Perspectives on Physics	1	Physical Education Elective	1
Humanities/Social Science Elective	3		16
	16		

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 242 Analytic Geometry & Calc. III	4	MA 341 Applied Differential Equations I	3
PY 202 General Physics	4	MA 405 Linear Algebra Matrices	3
Humanities/Social Science Elective	3	PY 203 General Physics	4
Free Elective	3	Humanities/Social Science Elective	3
Physical Education Elective	1	Free Elective	3
	15	Physical Education Elective	1
			17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 401 Applied Differential Equations II	3	ENG 333 Comm. for Science & Research	3
PY 411 Mechanics I	3	PY 412 Mechanics II	3
PY 414 Electricity & Magnetism I	3	PY 413 Thermal Physics	3
Humanities/Social Science Elective	3	PY 415 Electricity & Magnetism II	3
Free Elective	3	Free Elective	3
	15		15

SENIOR YEAR

Fall Semester	*Credits*
PY 401 Modern & Quantum Physics I	3
PY 452 Advanced Physics Lab	1
Humanities/Social Science Elective	3
Technical Electives	6
PY Elective	3
	16

Spring Semester	*Credits*
PY 402 Modern & Quantum Physics II	3
PY 452 Advanced Physics Lab	1
Humanities/Social Science Elective	3
Technical Electives	6
Free Elective	3
	16

Minimum Hours Required for Graduation 126

MINOR IN PHYSICS

The Physics Department offers a minor in physics to majors in any field except physics. To complete the minor 17 hours of specified physics courses are required, consisting of PY 205, 208, 407 (or 201, 202, 203) and two of PY 228, 411, 412, 413, 414, 415, 441.

STATISTICS

Cox Hall (Room 110)

Professor D. L. Solomon, *Head of the Department*

Assistant Professor B. J. Stines, *Undergraduate Administrator*

Distinguished University Professor and William Neal Reynolds Professor: C. C. Cockerham

Alumni Distinguished Graduate Professor: B. B. Bhattacharyya

Drexel Professor of Biomathematics: H. R. van der Vaart

Professors: R. L. Berger, B. B. Bhattacharyya, P. Bloomfield, D. D. Boos, C. C. Cockerham, D. A. Dickey, A. R. Gallant, T. M. Gerig, F. G. Giesbrecht, H. J. Gold, T. Johnson, J. F. Monahan, K. H. Pollock, C. H. Proctor, C. P. Quesenberry, J. O. Rawlings, D. L. Ridgeway, W. H. Swallow, H. R. van der Vaart, J. L. Wasik, B. S. Weir, O. Wesler; *Adjunct Professors:* H. T. Bhattacharyya, J. R. Chromy, A. L. Finkner, J. H. Goodnight, A. R. Manson, R. L. Obenchain; : *Professors Emeriti:* A. H. E. Grandage, R. J. Hader, D. W. Hayne, D. D. Mason, R. J. Monroe, L. A. Nelson, J. A. Rigney, R. G. D. Steel; *Associate Professors:* C. Brownie, E. J. Dietz, S. P. Ellner, A. C. Linnerud, D. W. Nychka, S. G. Pantula, T. W. Reiland, C. E. Smith, L. A. Stefanski; *Adjunct Associate Professors:* B. G. Cox, W. W. Piegorsch; *Assistant Professors:* M. Davidian, M. L. Gumpertz, J. C. Lu, B. J. Stines; *Senior Statisticians:* S. B. Donaghy, D. W. Turner; *Associate Statistician:* W. L. Cornelius; *Assistant Statisticians:* P. L. Marsh, S. E. Spruill; *Laboratory Supervisor:* J. T. Arnold; *Associate Members of the Statistics Faculty:* W. R. Atchley (Genetics), T. H. Emigh (Genetics), M. M. Goodman (Crop Science), W. L. Hafley (Forestry), A. R. Hall (Economics & Business), V. K. Smith (Economics & Business), M. W. Suh (Textiles); *Associate Members of the Biomathematics Faculty:* J. W. Bishir (Mathematics), T. Johnson (Economics & Business), G. Namkoong (Genetics), H. E. Schaffer (Genetics), S. M. Schneider (Plant Pathology), J. F. Selgrade (Mathematics), R. E. Stinner (Entomology), G. G. Wilkerson (Crop Science); *Adjunct Professor of Biomathematics:* M. W. Anderson; *Adjunct Assistant Professor of Biomathematics:* P. Dixon.

Statistics is the body of scientific methodology which deals with the logic of experiment and survey design, the efficient collection and presentation of quantitative information, and the formulation of valid and reliable inferences from sample data. The computer is used as a research tool by the statistician to perform the tasks of management and analysis of data collected from experiments and surveys.

The Department of Statistics is part of the Institute of Statistics, which includes Departments of Biostatistics and Statistics at Chapel Hill. The Department of Statistics provides instruction, consultation and computational services on research projects for other departments of all colleges at North Carolina State University including the Agricultural Research Service. Department staff are engaged in research in statistical theory and methodology. This range of activities furnishes a professional environment for training students in the use of statistical procedures in the physical, biological and social sciences, and in industrial research and development.

OPPORTUNITIES

The importance of sound statistical thinking in the design and analysis of quantitative studies is generally recognized and is reflected in the abundance of job opportunities for statisticians. Industry relies on statistical methods to control the quality of goods in the process of manufacture and to determine the acceptability of goods produced. Statistical procedures based on scientific sampling have become basic tools in such diverse fields as weather forecasting, opinion polling, crop and livestock estimation, and business trend prediction. Because one can improve the efficiency of use of increasingly complex and expensive experiment and survey data, the statistician is in demand wherever quantitative studies are conducted.

SCHOLARSHIPS AND AWARDS

The Department of Statistics recognizes the importance of superior academic performance through the awarding of scholarships and certificates of merit. Two scholarships are available for the freshman year for the purpose of attracting academically superior students. The North Carolina State University Chapter of Mu Sigma Rho, the national statistics honorary fraternity, accepts as members students who have had superior performance in statistics courses. Also, the outstanding senior statistics student is recognized through the awarding of an engraved plaque.

STATISTICS CURRICULUM

The undergraduate curriculum provides basic training for a career in statistics or for graduate study and leads to the bachelor of science in statistics. In addition to statistics, the curriculum includes study in mathematics, computer science, and the biological/physical sciences. While fulfilling their major elective requirements, students can either elect a minor or distribute their study across fields exploring the application of statistics in other fields, such as agriculture and life sciences, computer science, economics and business, industrial engineering, and the social sciences. A cooperative work-study option is also available.

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENG 111 Composition & Rhetoric	3	CSC 101 Introduction to Programming	3
MA 141 Analytic Geometry & Calculus I	4	ENG 112 Composition & Reading	3
PE 100 Health & Physical Fitness	1	MA 241 Analytic Geometry & Calculus II	4
PMS 100 Orientation to PAMS	1	Science Elective[1]	4
ST 101 Statistics by Example	3	Physical Education Elective	1
Humanities/Social Science Elective	3		15
	15		

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CSC 111 Introduction to FORTRAN Prog. *or*		COM (SP) 110 Public Speaking	3
CSC 295 Special Topics in Computer Science	2	MA 305 Elementary Linear Algebra	3
EB 201 Economics I	3	PSY 200 Introduction to Psychology *or*	
MA 242 Analytic Geometry & Calculus III	4	SOC 202 Principles of Sociology	3
ST 301 Statistical Methods I	3	ST 302 Statistical Methods II	3
Science Elective[1]	4	Science Elective[1]	4
Physical Education Elective	1	Physical Education Elective	1
	17		17

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ENG 331 Commun. for Engring. & Tech.	3	ST 422 Intro. to Mathematical Statistics II	3
ST 421 Intro. to Mathematical Statistics I	3	ST 431 Intro. to Experimental Design	3
ST 430 Intro. to Regression Analysis	3	ST 432 Intro. to Survey Sampling	3
Major Elective[2]	3	Humanities/Social Science Elective	3
Science Elective[1]	3-4	Major Elective[2]	3
	15-16	Mathematics Elective[3]	3
			18

SENIOR YEAR

Fall Semester	*Credits*
ST 435 Stat. Meth. for Qual. & Prod. Improv.	3
Humanities/Social Science Elective	3
Major Elective[2]	3
Major Elective[2]	3
Free Elective	3
	15

Spring Semester	*Credits*
ST 445 Intro. to Stat. Comp. & Data Mgmt.[4]	3
Humanities/Social Science Elective	3
Major Elective[2]	3
Statistics Elective[5]	3
Free Electives	6
	18

Minimum Hours Required for Graduation .....130[6]

[1]Two sequences selected from CH 101-107; PY 205-208; BS 100 and BO 200 *or* ZO 201; MEA 101 with 110 and MEA 102 *or* 130 *or* 200. At least one year of CH or PY.
[2]The major elective courses, selected from a list of approved major electives, require the approval of student's adviser.
[3]Mathematics elective to be one course selected from MA 341, 425, 427, 428, or 511.
[4]A major written report required.
[5]Statistics elective to be taken from a list of Statistics major elective courses.
[6]Not more than one D grade will be accepted in the required ST and MA courses, the major electives and CSC 101 (with a grade of C or better required in ST 421).

MINOR IN STATISTICS

The Department of Statistics offers a minor in statistics to majors in any field except statistics. The minor program consists of the successful completion of ST 301-302, ST 371-372 or ST 421-422, and one other approved Department of Statistics course with a grade of C or better in each course.

COLLEGE OF TEXTILES

College of Textiles, (Room 3-421) Centennial Campus

R. A. Barnhardt, *Dean*

D. R. Buchanan, *Associate Dean*

P. L. Grady, *Associate Dean*

S. P. Hersh, *Interim Associate Dean*

C. L. Barton, *Assistant to the Dean, Student Services*

P. L. Garwig, *Librarian, Burlington Textiles Library*

The field of textiles is broad. It covers almost every aspect of our daily lives with applications in medicine, space, recreation and sports, personal safety, environmental improvement and control, transportation, household and apparel uses. These versatile materials, textiles, are made to design specifications by a variety of modern high speed processes, utilizing tools such as lasers, electronics and computers. Textiles begins with the synthesis of fibers by man or by nature; textiles are carried through many processes for fabric formation, including the steps necessary to make fabrics useful, such as the manufacture of dyestuffs and colorants, chemical auxiliaries and finishes, and cutting and fashioning into end-use products.

The approximately 5,000 graduates of the College of Textiles hold diverse positions, many in North Carolina. In the textile and related industries, occupations range from manufacturing management, sales, and corporate management to designing and styling, research and development, technical service, quality control and personnel management. These textile graduates are in the creative and management decision-making aspects of the industry. They plan the flow of materials, processes and information. They create new products and processes. They solve product and process problems. They create styles, designs, patterns, colors, textures, and structures for apparel, home and industrial uses. They engineer systems and products required of industrial, space, medical, apparel and other uses of textile products. They deal with computers, automation, product quality, plant performance and environmental problems. They manage large and small companies, personnel, and systems.

The College of Textiles prepares its graduates for careers in these occupations. A broad background is stressed; two-thirds of the course work normally comes from other departments of the university. Opportunities remain excellent, with the college maintaining one of the University's best placement records. Demand for textile graduates from North Carolina State University is particularly strong, due mainly to the strength of the academic programs. These programs are offered by two degree granting departments: Textile and Apparel Management, and Textile Engineering, Chemistry, and Science.

CURRICULA

The College of Textiles offers a broad choice of curricula from which to choose. Bachelor of Science programs in Textiles, Textile and Apparel Management, Textile Science and Textile Chemistry are available. These programs allow students to choose from a wide range of courses in addition to required core courses. A Bachelor of Science in Textile Engineering offered jointly by the College of Textiles and the College of Engineering, is also available. The textile student's curriculum includes humanities, social sciences and basic sciences and may include concentrations in business, economics, industrial engineering, mathematics, physics, chemistry, computer science or statistics. A variety of dual degree possibilities are open to textile students, usually requiring at least 2 semesters additional study.

Inasmuch as professional textiles study is concentrated in the last two years of the student's program, it is possible for students from junior or community colleges, or other institutions of higher learning, to transfer to the College of Textiles with a minimum loss of time.

FIELD TRIPS

For certain textile courses, it is desirable for the student to see the manufacturing process under actual operating conditions. When possible, student groups visit outstanding manufacturing plants. Trip participation is required; transportation costs and other travel expenses, while held to a minimum, are paid by the student.

SUMMER EMPLOYMENT

Job opportunities for summer employment are available for textile students. Placement assistance is available through the college placement office and frequently can be arranged in the student's home community. Qualified students may arrange to receive academic credit through the Summer Interm program.

DEGREES

Upon completion of programs in either textiles, textile and apparel management, textile science, textile chemistry or textile engineering, the degree of Bachelor of Science is conferred.

The College of Textiles offers the following graduate degrees: Master of Textiles; Master of Science in Textiles, Master of Science in Textile Chemistry, and Doctor of Philosophy in Fiber and Polymer Science. For general requirements consult the Graduate Catalog.

By faculty agreement candidates for the Doctor of Philosophy degree in other schools of this University may specialize in textile-related subjects. In such cases, research is usually done in textiles.

FOUR-ONE PROGRAM

The College of Textiles has a program which permits a student with a baccalaureate degree from an accredited college or university to complete the requirements for a Bachelor of Science degree in textiles, textile and apparel management, textile science or textile chemistry after the satisfactory completion of a minimum of one year of study.

Applicants should have completed basic economics, mathematics, physics and chemistry requirements comparable with those required for the textile degree sought. Under these conditions, the student generally may complete the degree requirements in two summer sessions and two regular semesters. Students not meeting specific requirements in business economics, sciences, or mathematics should remove deficiencies prior to entering a specific degree program, otherwise the program of study may require three or more semesters.

Each applicant's undergraduate program is considered individually and, in general, a complete transfer of credits is possible.

HONORS PROGRAM

This program offers the exceptional student an opportunity to explore an area of special interest with exposure to various forms of research or independent study. Academically-promising entrants to the college, and students who show academic excellence during the freshman year, are assigned to honors advisers and are regarded as honors candidates. Special lectures, discussion groups and seminars in the freshman and sophomore years introduce the possibilities for future development in the honors program. Towards the end of the freshman year, selected honors candidates are invited to become full members of the honors program. In the sophomore year, with honors adviser's consent, honors students may begin to develop programs of strength in a special interest area. This may necessitate the substitution of preferred courses for those normally required, with the exception of certain basic textile courses. In the junior and senior year the student develops special interests,

culminating in an honors thesis. The honors thesis ranges from a scholarly review of a special topic to a discussion of an experimental research problem.

HONOR SOCIETY

Sigma Tau Sigma is the scholastic textile fraternity which was founded in the College of Textiles in 1929 to honor students who have a grade point average of 3.25 or higher. The main goal of this fraternity is to create a high standard of scholarship among textile students. Twice every year the local chapter selects as its prospective members junior textile students who meet the above criterion. Sigma Tau Sigma also promotes excellence by awarding a trophy to the graduating senior with the highest overall grade point average in the college.

TEXTILE SCHOLARS-IN-RESIDENCE PROGRAM

This program is sponsored by the College of Textiles and the Division of Student Affairs. It is a four-year program with emphasis on a textile seminar series and educational and cultural enrichment activities. These co-curricular activities include seminars on special topics related to the textile curriculum and profession, tutorial sessions, field trips and musical and drama performances. Students are invited to join this program after their acceptance at NCSU based on their predicted performance and must maintain a GPA of 3.0 to continue. All students are housed together with upperclassmen living with freshmen whenever possible.

ASSOCIATE OF THE TEXTILE INSTITUTE (ATI) DIPLOMA

The Textile Institute with headquarters in Manchester, England is a prestigeous international professional textile organization. This organization recognizes graduates from most of the College of Textiles programs who have achieved a GPA of 2.8 or higher. These graduates will be granted full exemption from the ATI examination.

SCOTTISH COLLEGE OF TEXTILES EXCHANGE PROGRAM

Selected students enrolled in the textile design concentration with junior standing are given the opportunity to spend the spring semester of the junior year at the Scottish College of Textiles while registered for textile design courses at NCSU. Tuition and fees are paid at the regular rate to NCSU. Travel costs for the selected students will be funded through the Louis Cramer Award in textile design which is administered by the College of Textiles. Each student will be responsible for costs of accommodations, meals and other personal needs.

Similar arrangements are available for students of the Scottish College of Textiles. The total exchange program is limited to 12 credit hours.

SILVER DESIGN MEDAL OF THE ROYAL SOCIETY OF ARTS, LONDON

The Royal Society of Arts, London has selected North Carolina State University as one of the universities eligible to award its silver medal to one graduate each year. This award is given to a student who demonstrates excellence in the field of textile styling/design and is presented at the May commencement ceremonies.

SCHOLARSHIPS

The Directors of the North Carolina Textile Foundation and friends of the College of Textiles have established an outstanding freshman scholarship program for textile majors:

Textile Foundation Merit Awards—These scholarships are renewable for up to four years of study at $3,500 per year, constituting an overall award of $14,000. A tuition differential may be added to the award for an out-of-state student. Four recipients are chosen every year.

Charles and Abraham Erlanger Merit Award—One renewable scholarship for $3,500 per year, for a total award value of $14,000.

Charles A. Hayes Merit Award—One renewable scholarship for $3,500 per year, for a total award value of $14,000.

Lineberger Merit Award—One renewable scholarship of $3,500 per year, for a total award value of $14,000.

Textile Freshman Prestige Scholarships—Up to twenty of these scholarships will be awarded to members of each class. Ranging from $1,000 to $2,000 per year, these scholarships are renewable for up to four years.

COOPERATIVE EDUCATION PROGRAM

This is a voluntary program which combines academic study with job experience. To be eligible for the program, a student must have completed two semesters at NCSU (one semester for transfer students) and have a minimum GPA of 2.25. The program provides for alternating semesters of full-time study and full-time work. A minimum of three work periods is required to complete the program.

FACILITIES

The new College of Textiles became a reality in the spring of 1990. The Centennial Campus, which contains the new facility as well as other research and educational facilities, has now grown to approximately 1,000 acres.

The North Carolina General Assembly allocated $27 million to build the College of Textiles facility and an additional $6 million for equipment modernization. The 298,000 square foot facility has been planned by the faculty and staff at the college, in conjunction with a review process for recommendation and improvements from key industry representatives. Space allocation for undergraduate programs is 34%, and for graduate and research program, 31%. The building plans call for new facilities for teaching and research since these two priorities are essential to strengthen the textile and allied industries in the U.S.

The college will develop a Model Manufacturing Facility within the new building that is capable of extruding fiber; spinning, weaving/knitting and finishing fabric; producing nonwovens; and constructing garments. This facility will be the only one of its kind in the world dedicated to textile industry/academic sponsorship. One of the first projects will be to develop a total and complete CIM environment within its laboratories.

The College of Textiles on the Centennial Campus will be the center for textile education and research in the U.S. Within its walls will be a critical mass of students, faculty, facilities, and programs that will "make a difference" for the U.S. fiber, textile, and apparel industries.

SPECIAL SERVICES

The College of Textiles offers several services and programs which enrich its academic programs.

Textile and Apparel Research is conducted on a wide variety of problems relating to the fiber, textile and apparel industries. Frequently, the problems are interdisciplinary and involve team effort. Students have an opportunity to participate in the solution to current problems.

Textiles Extension and Continuing Education is vigorously participated in by all faculty. It serves the needs of the textile industry by disseminating research findings and offering short courses for executive, scientific and supervisory personnel. The two-way exchange in these activities keeps students and faculty informed on all of the latest developments.

The Office of Student Services is responsible for the placement and financial aid programs of the College of Textiles. The placement office brings together industry recruiters and students for interview sessions for permanent and summer employment. Alumni may also take advantage of the placement office.

The financial aid function is operated by a committee. It is possible for any North Carolina student to pursue an education in textiles through scholarships, loans or grants, as long as he or she maintains the university's academic standards.

TEXTILE ENGINEERING, CHEMISTRY, AND SCIENCE

College of Textiles (Room 3-250), Centennial Campus

Professor C. D. Livengood, *Head of the Department*

Professor B. S. Gupta, *Assistant Head-Graduate Programs*

Professor K. R. Beck, *Assistant Head-Graduate Programs*

Alumni Distinguished Undergraduate Professor: C. D. Livengood

Alumni Distinguished Undergraduate Professor and Abel C. Lineberger Professor: P. R. Lord

Alumni Distinguished Graduate Professor: R. D. Gilbert

Charles A. Cannon Professor: S. P. Hersh

Cone Mills Professor: R. McGregor

Celanese Corporation Professor: J. A. Cuculo

Ciba-Geigy Professor: H. S. Freeman

Professors: R. L. Barker, D. R. Buchanan, J. A. Cuculo, A. H. El-Shiekh, H. S. Freeman, P. L. Grady, S. P. Hersh, R. McGregor, G. N. Mock, M. H. Mohamed, M. H. Theil, C. Tomasino, P. A. Tucker; *Adjunct Professors:* A. Ciferri, R. Goldman, J. E. Hendrix, T. Iijima, J. B. Levy, H. F. Mark, J. Preston, L. G. Roldan, A. Schindler, T. Tam; *Professors Emeriti:* J. F. Bogdan, K. S. Campbell, D. M. Cates, P. D. Emerson, T. W. George, R. D. Gilbert, D. S. Hamby, P. R. Lord, H. A. Rutherford, W. K. Walsh, W. M. Whaley, R. W. Work; *Associate Professors:* C. B. Smith; *Adjunct Associate Professors:* W. P. Behnke, L. D. Claxton, W. R. Martin, Jr., P. E. Sasser; *Associate Professors Emeriti:* T. H. Guion, A. C. Hayes, T. G. Rockow; *Assistant Professors:* P. Banks-Lee, A. C. Bullerwell, T. G. Clapp, H. Hamouda, S. M. Hudson, C. M. Pastore, J. W. Rucker, J. P. Rust; *Associate Members of the Faculty:* S. K. Batra (Textile and Apparel Management), R. E. Fornes (Physics).

The Department of Textile Engineering, Chemistry, and Science offers bachelor of science degrees embracing a number of disciplines. Students receive a fundamental knowledge of the science and engineering involved in the production of polymers, fibers, yarns and fabrics, and products based on them, and the process of dyeing and finishing.

The **B.S. in Textile Chemistry** is heavily oriented to the chemistry of polymers, their formation, and the preparation of textile materials for the consumer including scouring, bleaching, printing, dyeing and finishing. The degree program offers four different concentrations: (a) dyeing and finishing management, (b) dyeing and finishing operations, (c) dyeing and finishing science, and (d) polymer chemistry. The first two concentrations are primarily for students who want a bachelor of science degree, whereas the other concentrations are oriented toward students wanting advanced studies. However, the student taking dyeing and finishing operations or dyeing and finishing management can use elective courses to achieve a background suitable for graduate studies.

The **B.S. in Textile Engineering** provides a broad base of fundamental engineering courses as a foundation for studies in textile engineering. The textile engineering courses deal with the application of scientific and engineering principles to the design and control of all aspects of fiber, textile and apparel processes, products and machinery. These include natural and man-made materials, interaction of materials with machines, safety and health, energy conservation, and waste and pollution control. The B.S. in Textile Engineering is offered jointly with the College of Engineering. See that college for curriculum display.

The **B.S. in Textile Science** provides students with a fundamental knowledge of textile materials, including the science of modern materials and composites, as well as a technical understanding of the interactions between materials and machines in manufacturing operations. This curriculum combines elements of fiber physics, engineering, polymer science and production technology. It incorporates modern aspects of fiber material

science, including composites and advanced materials, computer applications and modern measurements into a science based program.

B.S. DEGREE IN TEXTILE CHEMISTRY
DYEING AND FINISHING MANAGEMENT CONCENTRATION

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 107 Principles Chemistry	4
ENG 111 Composition & Rhetoric	3	CSC 200 Intro. to Comp. & Use	3
MA 131 Analytic Geometry & Calc. A *or*		ENG 112 Composition & Reading	3
MA 141 Analytic Geometry & Calc. I	4	MA 231 Analytic Geometry & Calc. B *or*	
PE 100 Health & Physical Fitness	1	MA 241 Analytic Geometry & Calc. II	3-4
T 105 Intro. Text. Mat. Sci.	3	TC 203 Intro. to Polymer Chemistry	3
	15	Physical Education Elective	1
			17-18

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 221 Organic Chem. I	4	CH 223 Organic Chem. II	4
EB 201 Economics I	3	PY 212 College Physics II *or*	
PY 211 College Physics I *or*		PY 208 Physics Engr. Sci. II	4
PY 205 Physics Engr. Sci. I	4	TC 310 Text. Prep. Fin. Chem.	3
TC 301 Tech. Dye. Fin.	4	TT 250 Text Fabric Form. Systems	3
TS 211 Intro. Fiber Science	3	Free Elective	3
	18	Physical Education Elective	1
			18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
PSY 307 Indust. & Organ Psy.	3	TC 305 Intro. Color Sci. Appl.	3
TC 320 Textile Dyeing & Printing	4	TC 412 Textile Chem. Analysis	3
TC 441 Theory of Phys. Chem. Proc. Tex. I	3	TC 442 Theory of Phys. Chem. Proc. Text. II	3
TC 461 Intro. to Fiber-Form. Polymers	3	Humanities/Social Science Elective[2]	3
TT 220 Yarn Prod. Systems	3	Free Elective	3
Physical Education Electives	1		15
	17		

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
ACC 280 Managerial Account	3	TAM 480 Text Prod. Cost Cont.	3
TAM 380 Mgmt. Cont. Text Syst.	3	TC 407 Pilot Oper. & QC	3
Humanities/Social Science Electives[2]	6	TC 491 Seminar in Textile Chem.	1
Textile Chemistry Elective[1]	3	Humanities/Social Science Elective[2]	3
	15	Textile Chemistry Elective[1]	3
		Free Elective	3
			16

Minimum Hours Required for Graduation 131

NOTE: Credit gained for MA 111 Precalculus will be considered as excess credit and not applicable toward satisfying the 132 minimum hours required for graduation.

[1]Any TC elective course—6 credits.
[2]Humanities/Social Sciences Electives—University guidelines will be followed in that a minimum of 18 hours are required in addition to English 111 and 112. Six of these hours are specified: EB 201, Economics I, and PSY 307, Industrial and Organizational Psychology. Students are required to select at least six hours from humanities such as art and music (excluding skills courses), history, English, foreign languages (excluding FLE courses), philosophy, and religion. The final six hours can be selected from humanities or social sciences.

B.S. DEGREES IN TEXTILE CHEMISTRY
DYEING AND FINISHING OPERATIONS CONCENTRATION

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 107 Principles Chemistry	4
ENG 111 Composition & Rhetoric	3	CSC 200 Intro. to Comp. & Use	3
MA 131 Analytic Geometry & Calc. A *or*		ENG 112 Composition & Reading	3
MA 141 Analytic Geometry & Calc. I	4	MA 231 Analytic Geometry & Calc. B *or*	
PE 100 Health & Physical Fitness	1	MA 241 Analytic Geometry & Calc. II	3-4
T 105 Intro. Text. Mat. Sci.	3	TC 203 Intro. to Polymer Chem.	3
	15	Physical Education Elective	1
			17-18

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 221 Organic Chem. I	4	CH 223 Organic Chem. II	4
PY 211 College Physics I *or*		PY 212 College Physics II *or*	
PY 205 Physics Engr. Sci. I	4	PY 208 Physics Engr. Sci. II	4
TC 301 Tech. Dye. Fin.	4	TC 310 Text. Prep. Fin. Chem.	3
TS 211 Intro. Fiber Science	3	TT 250 Text. Fabric Form Systems	3
Humanities/Social Science Elective[4]	3	Free Elective	3
	18	Physical Education Elective	1
			18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
TC 320 Text. Dye & Print.	4	TC 305 Intro. Color Sci. Appl.	3
TC 441 Phys. Chem. Proc. Tex. I	3	TC 412 Text. Chem. Analysis	3
TC 461 Intro. to Fiber-Form. Pol.	3	TC 442 Phys. Chem. Proc. Text. II	3
TT 220 Yarn Prod. Systems	3	Humanities/Social Science Elective[4]	3
Humanities/Social Science Electives[4]	3	Free Elective	3
Physical Education Electives	1		15
	17		

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Humanities/Social Science Electives	6	TC 407 Pilot Oper. & QC	3
Restricted Elective[3]	3	TC 491 Seminar in Textile Chem.	1
TAM Elective[2]	3	Humanities/Social Science Elective[4]	3
TC Elective[1]	3	TAM, TS, TT Elective[2]	3
	15	TC Elective[1]	3
		Free Elective	3
			16

Minimum Hours Required for Graduation 131

NOTE: Credit gained for MA 111 Precalculus will be considered as excess credit and not applicable toward satisfying the minimum hours required for graduation.

[1]Any TC elective course—6 credits.
[2]Any TAM, TS or TT elective course—6 credits.
[3]Restricted elective: ST 361, CH elective, Math elective, ACC 280—3 credits.
[4]Humanities and Social Sciences Electives—University guidelines will be followed in that a minimum of 18 hours are required in addition to English 111 and 112. Selection will be from University-approved lists with at least six hours from humanities such as art and music (excluding skills courses), history, English, languages (excluding FLE courses), philosophy, and religion, and six hours from social sciences such as anthropology, economics, political science, psychology, sociology, and multidisciplinary studies. The final six can be selected from either humanities or social sciences.

B.S. DEGREE IN TEXTILE CHEMISTRY
DYEING AND FINISHING SCIENCE CONCENTRATION

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 107 Principles Chemistry	4
ENG 111 Composition & Rhetoric	3	CSC 200 Intro. to Comp. & Use	3
MA 141 Analytic Geometry & Calc. I	4	ENG 112 Composition & Reading	3
PE 100 Health & Physical Fitness	1	MA 241 Analytic Geometry & Calc. II	4
T 105 Intro. Text. Mat. Sci.	3	TC 203 Intro. to Polymer Chem.	3
	15	Physical Education Elective	1
			18

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 221 Organic Chemistry I	4	CH 223 Organic Chemistry II	4
MA 242 Analytic Geometry & Calc. II	4	MA 341 Appl. Diff. Equat. I	3
PY 205 Physics Engr. Sci. I	4	PY 208 Physics Engr. Sci. II	4
TC 301 Tech. Dyeing & Finishing	4	TC 310 Text. Prep. Fin. Chem.	3
Physical Education Elective	1	Free Elective	3
	17	Physical Education Elective	1
			18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
TC 320 Text. Dye & Print.	3	TC 305 Intro. Color. Sci. Appl.	3
TS 211 Intro. to Fiber Sci.	3	TC 412 Text. Chem. Analysis	3
TT 250 Text. Fab. Form. Struc.	3	TT 220 Yarn Prod. Systems	3
Humanities/Social Science Elective[4]	3	Humanities/Social Science Elective[4]	3
Phys. Chem./Thermo. Elect.[1]	3	Phys. Chem./Thermo. Elect.[1]	3
	15		15

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
TC 461 Intro. to Fib. Form. Pol.	4	TC 407 Pilot Oper. & QC	3
TC Elective[3]	3	TC 491 Seminar in TC	1
Humanities/Social Science Electives	6	Humanities/Soc. Sci. Electives	6
Free Elective[2]	3	Textile Chemistry Elective[2]	3
	16	Free Elective	3
			16

Minimum Hours Required for Graduation .....130[5]

NOTE: Credit gained for MA 111 Precalculus will be considered as excess credit and not applicable toward satisfying the minimum hours required for graduation.

[1]TC 441-442 or CH 431-433
[2]Any T, TAM or TC polymer chemistry elective course—6 credits
[3]Any TC dyeing/finishing elective course—3 credits
[4]See Humanities/Soc. Sci. note following Dyeing & Finishing Operations Concentration.
[5]D grades in ENG 111, CH 101, or MA 141 are not accepted toward graduation in Textile Chemistry.

B.S. DEGREE IN TEXTILE CHEMISTRY
POLYMER CHEMISTRY CONCENTRATION

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 107 Principles of Chemistry	4
ENG 111 Composition & Rhetoric	3	ENG 112 Composition & Reading	3
MA 141 Analytic Geometry & Calc. I	4	MA 241 Analytic Geometry & Calc. II	4
PE 100 Health & Physical Fitness	1	TC 203 Intro. to Polymer Chem.	3
T 105 Intro. Text. Mat. Sci.	3	Physical Education Elective	1
	15		15

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 221 Organic Chemistry I	4	CH 223 Organic Chemistry II	4
MA 242 Analytic Geometry & Calc. III	4	MA 341 Appl. Diff. Equat. I	3
PY 205 Physics Engr. Sci. I	4	PY 208 Physics Engr. Sci. II	4
TC 301 Tech. Dyeing Finish.	4	TS 211 Intro. to Fiber Sci.	3
Physical Education Elective	1	Humanities/Social Science Elective[6]	3
	17	Physical Education Elective	1
			18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
TC 461 Intro. to Fib. Form. Pol.	4	TC 305 Intro. Color Sci. Appl.	3
TT 220 Yarn Prod. Systems	3	Humanities/Social Science Elective[6]	3
TT 250 Text. Fab. Form. Struc.	3	Phys. Chem./Thermo. Elect.[4]	3
Phys. Chem/Thermo Elect[4]	3	Physical Sci./Math Elective[1]	2-4
Free Elective	3	Polymer Chem. Elect.[3]	3
	16		14-16

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
Dyeing Finishing Elective[2]	3	Dyeing Finishing Elect.[2]	3
Humanities/Social Science Electives[6]	6	Humanities/Social Science Elective[6]	6
Polymer Chemistry Elective[3]	6	Polymer Chem. Elect.[3]	3
Free Elective	3	Textiles Elective[5]	1-3
	18	Free Elective	3
			16-18

Minimum Hours Required for Graduation 129

NOTE: Credit gained for MA 111 Precalculus will be considered as excess credit and not applicable toward satisfying the 130 minimum hours required for graduation.

RESTRICTED ELECTIVES

[1] Physical Science/Math Electives—2-4 credits from the following:

CH 315	4
CSC 101	3
CSC 111	2
ST 361	3

[2] Dyeing and Finishing—6 credits from the following:

T 401	3
TC 320	4
TC 412	3
TC 451	3
TC 491	1
TC 505	3
TC 520	3
TC 530	3
TC 591	3

[3] Polymer Chemistry electives—nine credits from the following:

T 402	3
TC 504	3
TC 561	3
TC 562	3
TC 565	3
TC 569	3
TC 591 (Polymer Lab Course)	3
TS 460	3

Three additional credits from either the list above or the following:

TC 490	1-6
TC 591	3

[4]Physical Chemistry/Thermodynamics—6 credits from the following:

CH 431 3
CH 433 3

or

TC 441 3
TC 442 3

[5]Textiles—1-3 credits in TC, TAM, TT, TS, or T courses at 300-500 level (including any elective course in dyeing and finishing or polymer chemistry listed above).

[6]See Humanities/Social Sciences note following Dyeing and Finishing Operations Concentration.

MINOR IN TEXTILE CHEMISTRY

The Textile Engineering, Chemistry, and Science Department offers a minor in textile chemistry to majors in any field except Textile Chemistry. The program is designed to expose students to the technical and scholarly disciplines of polymer chemistry, fiber formation, color physics, dyeing, and chemical modification of fabrics, and gives them an opportunity to learn how basic disciplines are applied in an industrial environment. Any interested student should contact the assistant department head of Textile Engineering, Chemistry, and Science for information about the minor and its prerequisites.

B. S. DEGREE IN TEXTILE ENGINEERING

See Textile Engineering curriculum under College of Engineering.

B.S. DEGREE IN TEXTILE SCIENCE

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 103 General Chemistry II *or*	
ENG 111 Composition & Rhetoric	3	CH 105 Chem. Princ. & Applic. *or*	
MA 141 Analytic Geometry & Calc. I	4	CH 107 Principles of Chemistry	3-4
PE 100 Health & Physical Fitness	1	ENG 112 Composition & Reading	3
T 105 Intro. Text. Mat. Sci.	3	MA 241 Analytic Geometry & Calc. II	4
	15	TT 220 Yarn Product Systems	3
		Humanities/Social Science Elective[2]	3
		Physical Education Elective	1
			17-18

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
MA 242 Analytic Geometry & Calc. III	4	MA 341 Applied Diff. Equations I	3
PY 205 Physics Engr. & Sci. I	4	PY 208 Physics Engr. & Sci. II	4
TC 203 Intro. to Polymer Chem.	3	ST 361 Intro. to Stat. Engrs.[1]	3
TT 250 Text. Fab. Form. Struct.	3	TC 301 Tech. of Dyeing & Finish.	4
Humanities/Social Science Elective[2]	3	TS 211 Intro. to Fiber Science	3
Physical Education Elective	1	Physical Education Elective	1
	18		18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CSC 111 Algorithmic Lang. I	2	ENG 331 Comm. Engr. Tech.	3
TT 330 Text. Meas. Qual. Cont.	4	TT 305 Dir. Fiber-Fab. Prod.[3] *or*	
TT 341 Knitting Syst.[3] *or*		TT 320 Mech. Sp. Yn. Mfg. Sys. *or*	
TT 351 Weaving Syst.[3]	3	TT 420 Mod. Dev. Yn. Mfg.[3]	3-4
Restricted Electives[4]	6	TT 351 Weaving Syst.[3]	3
Free Elective	3	Humanities/Social Science Elective[2]	3
	18	Restricted Electives[4]	5
			17-18

SENIOR YEAR

Fall Semester	*Credits*
TS 460 Phy. Prop. of Text. Fib.	3
Humanities/Social Science Electives[2]	6
Restricted Elective[4]	3
Free Elective	3
	15

Spring Semester	*Credits*
TS 461 Mech. Prop. Fib. Struc.	3
TT 425 Text. Yn. Prod. & Prop.[3] *or*	
TT 420 Mod. Dev. Yn. Mfg.[3]	3
Humanities/Soc. Sci. Elective[2]	3
Restricted Elective[4]	3
Free Elective	3
	15

Minimum Hours for Graduation 133

Note: Credit gained for MA 111, Precalculus, will be considered as excess credit and not applicable toward satisfying the 133 minimum hours required for graduation.

[1]ST 361(T) recommended for Textile students

[2]Humanities/Social Science Electives—18 hours are required in addition to English 111 and 112. Three hours are specified; EB 201. The remaining courses will be selected from a University-approved lists with a minimum of two electives in a graded sequence from the social sciences electives and two courses in a graded sequence from the humanities electives. A graded sequence is defined as (a) A two-course sequence in which the first course is a prerequisite to the second, or (b) A two-course sequence in which the second course is at the 300 level or higher.

[3]Textile Electives—12(13) hours

a. TT 320 4
   TT 420 3
   TT 425 3

b. TT 305 3
   TT 351 3
   TT 341 3

[4]*Restricted Electives*—17 hours

The restrictive electives are designed to give the student a greater science base in one or more areas. The 17 hours will be chosen from two or more of the groups of courses listed below. Maximum of 12 hours allowed from group F. Students are encouraged to elect TMT 380 from among the restricted electives.

Some of the courses listed here have prerequisites which have not been specified in the detailed curriculum. They may be taken by the students either as free electives or for extra credit.

A. Math & Statistics
300 level and above

B. Mech. & Mat. Engr.
200 level and above

C. Physics
300 level and above

D. Computer Science
Any course except CSC 200

E. Chemistry
200 level and above

F. Advanced Textiles and Operations

a. Textile (TS, TT, TAM, TC, T) courses; i.e. TT 305, TT 341, TT 351, TAM 380, TC 320, and any TT, TAM, TC or T course at the 400 level and above.
b. IE courses at 300 level or above except IE 301, 340, 341, 345 or 346.
c. EB course: 301, 302, 320, 404, 422, 451 and all 500 level courses.

TEXTILE AND APPAREL MANAGEMENT

College of Textiles (Room 3-245), Centennial Campus

Professor T. J. Little, *Head of the Department*

Alumni Distinguished Undergraduate Professor: M. L. Robinson

Professors: R. A. Barnhardt, S. K. Batra, G. A. Berkstresser, R. A. Donaldson, A. H. M. El-Shiekh, T. J. Little, M. H. Mohamed; *Adjunct Professor:* W. A. Klopman; *Professors Emeriti:* E. B. Grover, A. B. Moss, J. A. Porter, W. E. Shinn, W. C. Stucky; *Associate Professors:* T. F. Gilmore, P. B. Hudson, L. T. Lassiter, M. L. Robinson, G. W. Smith, M. W. Suh; *Adjunct Associate Professors:* D. M. Powell, D. L. Spanton, S. M. Zartarian; *Visiting Associate Professors:* M. J. Gerra, N. A. Hunter, E. M. McPherson; *Associate Professors Emeriti:* E. H. Bradford, E. E. Hutchinson, J. W. Klibbe, W. E. Moser, J. W. Pardue; *Assistant Professors:* P. Banks-Lee, H. Hergeth, G. L. Hodge, F. W. Massey; *Adjunct Assistant Professor:* R. H. Johnson; *Visiting Assistant Professor:* T. K. Ghosh; *Assistant Professor Emeriti:* H. M. Middleton; *Extension Specialists:* H. M. Allen, W. J. Carter, L. S. Moser, C. L. Seastrunk; *Research Assistant:* E. C. Carrere, W. C. Hewitt.

The Department of Textile and Apparel Management offers bachelor of science degrees in Textile and Apparel Management and in Textiles. Each degree permits the student to specialize in concentrations and the curricula combine a foundation both in textile management and textile technology principles and applications. The BS Textile and Apparel Management degree has a Management concentration and an Apparel concentration, while the BS Textiles degree has a Technology concentration and a Design concentration.

The BS in Textile and Apparel Management, together with its concentrations, provides opportunities for the student to get additional background in apparel manufacturing, production factors, law and labor relations, management science, mathematics, finance, accounting, dyeing and finishing, textile design and textile technology.

The BS in Textiles, Technology concentration, offers the student a background in the technology of fibers, yarns and fabrics and the manufacturing processes involved. The Design concentration gives a broad foundation in textiles and specializes in the application of design principles to the wide range of textile materials.

Opportunities for outstanding undergraduate students are allowed in graduate studies including research sponsored by University funds and industrial and government sponsors.

The Textile and Apparel Management department also administrates the Eli Whitney Scholarship program for students wishing to undertake a study of international business in conjunction with their textile studies. This program permits the student to earn a BA degree as offered by the College of Humanities and Social Science and a BS degree in Textile and Apparel Management.

B.S. DEGREE IN TEXTILES, TEXTILE DESIGN CONCENTRATION

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CSC 200 Intro. Comput. & Use[3]	3
ENG 111 Comp. & Rhetoric	3	ENG 112 Comp. & Reading	3
MA 131 Analy. Geom. Calc. A *or*		MA 231 Analy. Geom. & Calc. B *or*	
MA 141 Analy. Geom. & Calc. I	4	MA 241 Analytic Geometry & Calc. II	3-4
PE 100 Health & Phys. Fit.	1	TAM 170 Textile Design Orient.	1
T 105 Intro. Text. Mat. Sci.	3	TT 220 Yarn Prod. Systems	3
	15	Humanities/Social Science Elective[1]	3
		Physical Education Elective	1
			17-18

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
DF 101 Design Fund. I[2] *or*		PY 208 Physics Engr. Sci. II *or*	
DF 111 Two Dim. Design	6-3	PY 212 College Physics II	4
PY 205 Physics Engr. Sci. I *or*		ST 361T Intro. Stat. Engrs.	3
PY 211 College Physics I	4	TAM 272 Print Text. Design	3
TC 203 Intro. Polymer Chem. *or*		TC 203 Intro. Polymer Chem. *or*	
TS 211 Intro. Fiber Sci.	3	TS 211 Intro. Fiber Sci.	3
TT 250 Text. Fab. Form Struc.	3	TT 341 Knitting Systems	3
Humanities/Social Science (EB 301)[1]	3	Physical Education Elective	1
Physical Education Elective	1		17
	17-20		

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
TAM 330 Text. Meas. Qual. Cont.	4	ENG 331 Commun. Engr. & Tech.	3
TAM 371 Woven Text. Design	3	TAM 372 Knitted Text. Design	3
TC 301 Tech. Dyeing Fin.	4	TAM 380 Mgmt. Contr. Text. Syst.	3
TT 351 Weaving Systems	3	TT 305 Dir. Fib. Fab. Prod.	3
Humanities/Social Science Elect.	3	TT 320 Mech. Sp. Yarn Mfg. Sys.	4
	17		16

T 493 Industrial Internship in Textiles[4] 3

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
TAM 470 Text. Design Studio	6	TS 460 Phys. Prop. Text. Fib.	3
T 495 Senior Seminar	1	TT 370 Tech. Fabric Design	4
TT 425 Text. Yarn Prod. Prop.	3	Free Electives	6
Humanities/Social Science Elective[1]	3	Humanities/Social Science Elective[1]	6
Free Elective	3	New York Trip[5]	
	16		19

Minimum Hours for Graduation 133

NOTE: 1. Credit gained for MA 111, Precalculus, will be considered as excess and not applicable toward satisfying the 133 minimum hours required for graduation.

[1]Humanities/Social Sciences Electives
A minimum of 18 hours are required in addition to English 111 and 112. Selection will follow University guidelines and come from University-approved course lists. At least 6 hours of humanities are required. At least 6 hours of social sciences are required. EB 201 is specified as one of these courses. A two-course graded sequence in the same discipline is required in either humanities or in social sciences. A graded sequence is defined as: a) A two-course sequence in which the first course is prerequisite to the second, or b) A two-course sequence in which the second course is at the 300 level or higher. The remaining hours will come from either humanities, social sciences or both.

[2]DF 101 DESIGN FUNDAMENTALS I (6 credits): Open only to textile students with a 2.5 GPA plus acceptable portfolio, and who have been accepted into the course by the recommendation of the School of Design interview panel. This course is an elected alternative to DF 111 for certain students who meet the entry requirements. An excess of 3 credits will be incurred, and special curricular arrangements will have to be made in consonance with the academic coordinator of the student's department.

[3]Computer Science - TDC students may elect to take DN 415 Microcomputer Graphics for Designers - (3 credits) in lieu of CSC 200.

[4]Summer Internship - students are encouraged to apply for an industrial internship, between their junior and senior years. The program number to sign up for is T 493. This is an optional course and will come from free electives.

[5]NEW YORK TRIP - during spring break of the senior year, a 6-day program of professional visits is arranged in the city. This is a very important part of the program of study, and all students are strongly encouraged to plan ahead for this event.

B.S. DEGREE IN TEXTILES, TEXTILE TECHNOLOGY CONCENTRATION

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	CH 103 General Chemistry II *or*	
ENG 111 Composition & Rhetoric	3	CH 107 Principles of Chemistry	4
MA 131 Analytic Geometry & Calc. A *or*		ENG 112 Composition & Reading	3
MA 141 Analytic Geometry & Calc. I	4	MA 231 Analytic Geometry & Calc. B *or*	
PE 100 Health & Physical Fitness	1	MA 241 Analytic Geometry & Calc. II	3.4
T 105 Intro. Text. Mat. Sci.	3	TT 220 Yarn Prod. Systems	3
	15	Humanities/Soc. Sci. Elective[2]	3
		Physical Education Elective	1
			17-18

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CSC 200 Intro. to Computers & Use	3	PY 212 College Physics I *or*	
EB 201[2] Economics I	3	PY 208 Physics Engr. Sci. II	4
PY 211 College Physics I *or*		ST 361 Intro. Stat. for Engrs.[1]	3
PY 205 Physics Engr. Sci. I	4	TC 203 Intro. to Polym. Chem. *or*	
TC 203 Intro. to Polymer Chem. *or*		TS 211 Intro. to Fiber Sci.	3
TS 211 Intro. to Fiber Sci.	3	TT 320 Mech. Sp. Yn. Mfg. Syst.	4
TT 250 Text. Fab. Form. Struc.	3	TT 341 Knitting Systems	3
Physical Education Elective	1	Physical Education	1
	17		18

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
TAM 330 Text. Meas. & Qual. Cont.	4	ENG 331 Comm. Engr. Tech.	3
TC 301 Tech. Dyeing & Finish	4	TAM 380 Mgmt. & Cont. of Text. Syst.	3
TT 351 Weaving Systems	3	TT 305 Dir. Fiber to Fab. Prod.	3
TT 425 Text. Yarn Prod. & Prop.	3	TT 370 Technical Fabric Design	4
Humanities/Soc. Sci. Electives[2]	3	Textile Concentration[3]	3
	17	Free Elective	3
			19

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
TS 460 Phy. Prop. of Text. Fib.	3	Humanities/Social Science Electives[2]	6
TT 495 Senior Seminar	1	Textile Concentration[3]	6
Humanities/Social Science Elective[2]	3	Free Elective	3
Textile Concentration[3]	6		15
Free Elective	3		
	16	Minimum Hours for Graduation	134

Note: Credit gained for MA 111 will be considered as excess credit and not applicable toward satisfying the 131 minimum hours required for graduation.

[1]ST 361 (T) recommended for Textile students

[2]Humanities/Social Science Electives—A minimum of 18 hours are required in addition to English 111 and 112. Selection will follow University guidelines and come from University-approved course lists. At least 6 hours in humanities and 6 hours in social sciences are required; EB 201 is a specified social science course. A two-course graded sequence in the same discipline is required in either humanities or social sciences. A graded sequence is defined as: (a) A two-course sequence in which the first course is prerequisite to the second, or (b) A two-course sequence in which the second course is at the 300 level or higher. The remaining hours will come from either humanities or social sciences or both.

[3]*Textile Concentrations* (15 credit hours)
Select 9 credit hours from *one* group, either group A or group B, and 6 additional hours from any of the groups. (Credit will not be allowed for both TAM (PD) 371 and TT 451.)

A *Mfg. Tech.*		B *Quality Control*		C *Color & Design*	
TT 405	3	IE 352	3	TAM 371	3
TT 420	3	TAM 431	3	TAM 372	3
TT 443	3	TAM 490	3	TC 305	3
TT 450	3	TAM 530	3	TT 350	3
TT 451	3	TES 500	3		
TT 490	3				

D	E	F
Apparel Tech.	*Fiber Science*	*Mgt. Science*
TAM 215 3	CH 220 4	ACC 280 3
TAM 315 3	T 402 3	TAM 381 3
TAM 316 3	TC 412 3	TAM 480 3
	TS 461 3	TAM 487 3

B. S. DEGREE IN TEXTILE AND APPAREL MANAGEMENT, APPAREL MANAGEMENT CONCENTRATION

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	ENG 112 Composition & Reading	3
ENG 111 Comp. & Rhetoric	3	Hum/Soc. Sci. (EB 201)[2]	3
MA 131 Analy. Geom. Calc. A *or*		MA 231 Analytic Geometry & Calc. B *or*	
MA 141 Analy. Geom. & Calc. I	4	MA 241 Analytic Geometry & Calc. II	3-4
PE 100 Health & Phys. Fit.	1	T 203 Intro. Polymer Chemistry	3
T 105 Intro. Text. Mat. Sci.	3	TT 220 Yarn Prod. Systems	3
	15	Physical Education Elective	1
			16-17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CSC 101 Intro. to Program *or*		ACC 280 Managerial Accounting	3
CSC 111 Intro. Fortran Prog. *or*		PY 208 Physics Engr. Sci. II *or*	
CSC 200 Intro. Computer & Use	2-3	PY 212 College Physics II	4
PY 205 Physics Engr. Sci. I *or*		ST 361T Intro. Stat. Engrs.[1]	3
PY 211 College Physics I	4	TAM 215 Intro. Apparel Tech.	3
TT 250 Text. Fab. Form Struc.	3	TS 211 Intro. Fiber Sci.	3
Hum/Soc. Sci. (EB 301)[2]	3	Physical Education Elective	1
Hum/Soc. Sci. Elective[2]	3		17
Physical Education Elective	1		
	16-17		

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
EB 302 Inter. Macroeconomics	3	EB 313 Marketing Methods *or*	
TAM 315 Apparel Product I	3	TAM 382 Prin. Soft Goods Mkt.	3
TAM 331 Qua. Ctr. Tx. Prod. Mgt.	3	EB 320 Financial Manage	3
TAM 380 Mgmt. Cont. Text. Syst.	3	ENG 331 Commun. Engr. & Tech.	3
TC 301 Tech. Dye. Fin.	4	TAM 316 Apparel Product II	3
Free Elective	3	TAM 480 Text. Prod. Cost Cont.	3
	19	Hum/Soc. Sci. (PSY 307)[2]	3
			18

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
IE 352 Work Analy. and Design	3	TAM 484 Mgt. Dec. Mak. Text. Firm	3
TAM 431 Fab. Perform Test	3	Humanities/Social Science Elective[2]	3
TAM 482 Text. Mkt. Management	3	Textile Elective[3]	3
Humanities/Social Science Elective[2]	3	Textile Elective[3]	3
Textile Elective[3]	3	Free Elective	3
Free Elective	3		15
	18		
		Minimum Hours for Graduation	134

NOTE: 1. Credit gained for MA 111, Algebra and Trigonometry, will be considered as excess and not applicable toward satisfying the 134 minimum hours required for graduation.
2. A minimum grade of C is required in EB 201, TAM 380, and ACC 280.

[1]ST 361T Recommended for Textile students (see Schedule of Classes)

[2]Humanities/Social Sciences Electives

University guidelines will be followed in that a minimum of 18 hours are required in addition to English 111 and 112. Selection will be from University-approved lists with at least 6 hours from humanities and at least 6 hours from social sciences. In this curriculum EB 201, Economics I, EB 301, Intermediate Microeconomics, and PSY 307, Industrial and Organizational Psychology, are required. These courses satisfy University requirements of a minimum of 6 hours in social sciences, and also the departmental requirement of a two course graded sequence in the same discipline. A graded sequence is defined as a) A two course sequences in which the first course is prerequisite to the second, or b) A two course sequence in which the second course is at the 300 level or higher. At least 6 of the remaining hours must be selected from the humanities area. The final 3 hours can be selected from humanities or social sciences.

[3]Textile Electives - 12-13 hours.

Students have the option of selecting four courses, two from each grouping shown.

A.	B.	C.
TT 305 - 3	TAM 383 -3	TS 460 - 3
TT 320 - 4	TT 351 -3	TT 420 - 3
TT 341 - 3	TT 370 - 4	TT 425 - 3

TAM 431 - 3 (Required for Apparel Manufacturing and Management Concentration.

B.S. DEGREE IN TEXTILE AND APPAREL MANAGEMENT, TEXTILE MANAGEMENT CONCENTRATION

FRESHMAN YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CH 101 General Chemistry I	4	ENG 112 Composition & Reading	3
ENG 111 Composition & Rhetoric	3	MA 231 Analytic Geometry & Calc. B *or*	3
MA 131 Analytic Geometry & Calc. A *or*	4	MA 241 Analytic Geometry & Calc. II	4
MA 141 Analytic Geometry & Calc. I	4	T 203 Intro. Polymer Chemistry	3
PE 100 Physical Education	1	TT 220 Yarn Prod. Systems	3
T 105 Intro. Text. Mat. Sci.	3	Humanities/Soc. Sci. (EB 201)[2]	3
	15	Physical Education Elective	1
			16-17

SOPHOMORE YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
CSC 101 Intro. to Program *or*		ACC 280 Managerial Accounting	3
CSC 111 Intro. Fortran Prog. *or*		PY 208 Physics Engr. Sci. II *or*	
CSC 200 Intro. to Computers & Use	2-3	PY 212 College Physics II	4
PY 205 Physics Engr. Sci. I *or*	4	ST 361[1] Intro. Stat. Engrs.	3
PY 211 College Physics I	4	TAM 380 Mgmt. Cont. Text. Syst.	3
TT 250 Text. Fab. Form Struc.	3	TS 211 Intro. Fiber Science	3
Hum/Soc. Sci. (EB 301)[2]	3	Physical Education Elective	1
Hum/Soc. Sci. Elective[2]	3		17
Physical Education Elective	1		
	16-17		

JUNIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
EB 302 Inter Macroeconomics	3	EB 313 Marketing Methods *or*	3
ENG 331 Commun. Engr. & Tech.	3	TAM 382 Prin. Soft Goods Mkt.	3
TAM 331 Qua. Ctr. Tx. Prod. Mgt.	3	EB 320 Financial Manage	3
TC 301 Tech. Dye. Fin.	4	TAM 480 Text. Prod. Cost Cont.	3
Management Elective[4]	3	Hum/Soc. Sci. (PSY 307)[2]	3
Free Elective	3	Textile Elective[3]	3
	19	Textile Elective[3]	3
			18

SENIOR YEAR

Fall Semester	*Credits*	*Spring Semester*	*Credits*
TAM 482 Text. Mkt. Management	3	TAM 484 Mgt. Dec. Mak. Text. Firm	3
Hum/Soc. Sci. Elective[2]	3	Hum/Soc. Sci. Electives[2]	3
Management Elective[4]	3	Management Elective[4]	3
Textile Elective[3]	3	Textile Elective[3]	3
Free Elective	3	Free Elective	3
	15		15

Minimum Hours for Graduation 131

NOTE: 1. Credit gained for MA 111, Algebra and Trigonometry, will be considered as excess and not applicable toward satisfying the 131 minimum hours required for graduation.

2. A minimum grade of C is required in EB 201, TAM 380, and ACC 280.

[1]ST 361 (T) Recommended for Textile students (see Schedule of Classes)

[2]Humanities/Social Sciences Electives

University guidelines will be followed in that a minimum of 18 hours are required in addition to English 111 and 112. Selection will be from University-approved lists with at least 6 hours from humanities and at least 6 hours from social sciences. In this curriculum EB 201, Economics I, EB 301, Intermediate Microeconomics, and PSY 307, Industrial and Organizational Psychology, are required. These courses satisfy University requirements of a minimum of 6 hours in social sciences, and also the departmental requirement of a two-course graded sequence in the same discipline. A graded sequence is defined as a) A two-course sequence in which the first course is prerequisite to the second, or b) A two-course sequence in which the second course is at the 300 level or higher. At least 6 of the remaining hours must be selected from the humanities area. The final 3 hours can be selected from humanities or social sciences.

[3]Textile Electives - 12-13 hours.

Students have the option of selecting four courses, two from each grouping shown.

A.	B.	C.
TT 305 3	TAM 383 .. 3	TAM 431 .. 3
TT 320 4	TT 351 3	TS 460 3
TT 341 3	TT 370 4	TT 420 3
		TT 425 3

[4]MANAGEMENT ELECTIVES—9-12 hours.

The management component of this curriculum is expanded to include a sequence of courses from one of the following groupings:

Production Factors	*Law and Labor Relations*		*Management Science Math*	*Finance Accounting*	
IE 307 3	EB 307 3	*or*	MA 242 4	ACC 210 3	EB 350 3
IE 311 3	EB 308 3		MA 341 3	ACC 220 3	EB 404 3
IE 353 3	EB 326 3		MA 405 3	ACC 310 3	EB 422 3
IE 355 3	EB 332 3		MA 421 3	ACC 311 3	EB 448 3
IE 420 3	EB 431 3	*or*	MA 425 3	ACC 320 3	EB 451 3
IE 421 3	IE 355 3		MA 426 3	ACC 420 3	
PSY 340 3	PSY 340 3		MA 511 3	IE 307 3	
T 401 3	T 401 3		MA 512 3	IE 311 3	
TT 420 3	TAM 381 3		ST 421 3	IE 420 3	
	TAM 487 3		ST 422 3		

Apparel	*Dyeing and Finishing*[a]		*Textile Design*[b]	*Textile Operations*	
TAM 215 3	CH 220 4	TC 320 4	DF 111 3	TS 460 3	TT 425 3
TAM 216 3	TC 310 3	TC 407 3	TAM/PD 272 3	TS 461 3	TT 443 3
TAM 315 3			TAM/PD 371 3	TT 405 3	TT 450 3
TAM 316 3			TAM/PD 372 3	TT 420 3	TT 451 3

[a]Dyeing and Finishing—Some courses require prerequisites which may not have been taken as part of the degree program.

[b]Textile Design—Students electing this sequence must take all four courses.

COLLEGE OF VETERINARY MEDICINE

T. M. Curtin, *Dean*

R. B. Ford, *Associate Dean and Director of Veterinary Services*

D. R. Howard, *Associate Dean and Director of Academic Affairs*

C. E. Stevens, *Associate Dean and Director of Graduate Studies & Research*

C. A. McPherson, *Director of Laboratory Animal Resources*

No specific undergraduate degree track is associated with a pre-professional veterinary medicine program. However, faculty members from the College of Veterinary Medicine and the College of Agriculture and Life Sciences serve as advisors to undergraduate students enrolled and pursuing a baccalaureate program usually in a science related field. Pre-professional course requirements are listed below. After completion of the required courses, students may be eligible to apply for the professional veterinary program. Course requirements may be changed annually and are determined by the Committee on Admissions in the College of Veterinary Medicine. For further information about admissions requirements and the professional program contact the College of Veterinary Medicine Office of Admissions (4700 Hillsborough St., 919-829-4200 or 4205).

Undergraduate applicants with interests in veterinary medicine enrolled in the undergraduate programs at North Carolina State University at Raleigh *are expected to be pursuing a baccalaureate degree* (to include the social science and humanities requirements in the appropriate curriculum). Minimum requirements and course stipulations for curriculum planning should be followed through each of the departments or schools offering the appropriate degree. It is the responsibility of the students and their pre-professional advisors to be knowledgeable of those requirements.

All courses listed below should be completed by the applications deadline, except nutrition* and biochemistry* which must be completed by the summer prior to entry.

PRE-PROFESSIONAL COURSE REQUIREMENTS

	Credits
Languages (6 Credits)	
ENG 111 Composition & Rhetoric	3
ENG 112 Composition & Reading	3
Physical Sciences (43 Credits)	
*BCH 451 Elementary Biochemistry	3
CH 101 General Chemistry	4
CH 107 Principles of Chemistry	4
CH 221, 223 Organic Chemistry I, II	8
MA 131 Analytical Geometry & Calculus A	4
or, you may substitute MA 121 for MA 131	
MA 121 Elements of Calculus	4
PY 211, 212 General Physics *or*	8
PY 221 College Physics	5
ST 311 Introduction to Statistics	3
Biological Sciences (14-15 Credits)	
*ANS 204 Livestock Feeds and Feeding	4
or, you may substitute one of the following	
*ANS (NTR, PO) 415 Comparative Nutrition *or*	
*NTR 301 Modern Nutrition	3
BS 100 General Biology	4
GN 411 The Principles of Genetics	3
MB 401 General Microbiology	4

Humanities and Social Science (12 Credits)

Humanities Electives	6
Social Science Electives	6

PROFESSIONAL DEGREE PROGRAM & CAREER OPPORTUNITIES

Veterinary medicine is a science career dealing with the recognition, treatment, control and prevention of diseases in animals. Career options are unlimited and variable as animal health impacts upon the health and economic welfare of the nation. DVM candidates may select several career options upon graduation. Federal government, private industry, private practice, and research and teaching activities in a university setting are all possible for graduates and licensed doctors of veterinary medicine. Successful completion of the professional training program should prepare students for appropriate state licensing examination in the state of North Carolina and others. Persons interested in the professional courses offered may receive a brochure by contacting the College of Veterinary Medicine.

ANATOMY, PHYSIOLOGICAL SCIENCES AND RADIOLOGY

Professor A. L. Aronson, *Head of the Department*

Alumni Distinguished Professor: J. B. Smallwood

Burroughs Wellcome Professor: P. Bentley

Professors: K. B. Adler, R. A. Argenzio, P. J. Bentley, N. C. Olson, J. E. Riviere, J. E. Smallwood, C. S. Teng, D. E. Thrall; *Adjunct Professor:* G. L. Fisher, L. M. Jones, D. W. Powell, B. A. Schwetz, F. Welsch, R. S. H. Yang; *Associate Professor:* S. A. Bai, C. F. Brownie, L. N. Fleisher, L. C. Hudson, R. E. Meyer, C. L. Robinette, P. L. Sannes; *Adjunct Associate Professor:* W. J. Croom, Jr., T. E. Eling, S. Grosshandler, M. S. Hand, M. Negishi, J. A. Raleigh, C. T. Teng, R. D. Voyksner; *Assistant Professor:* H. M. Berschneider, J. E. Gadsby, P. W. Hellyer, B. P. Peters, I. W. Smoak, K. A. Spaulding, C. R. Swanson; *Adjunct Assistant Professor:* M. W. Dewhirst; *Visiting Assistant Professor:* D. P. Aucoin, B. R. Grubb, L. J. Konde, M. C. McGahan, N. A. Monteiro, M. B. Whiteley, P. L. Williams; *Instructor:* B. D. Hansen.

COMPANION ANIMAL AND SPECIAL SPECIES MEDICINE

Professor M. K. Stoskopf, *Head of the Department*

Professors: C. W. Betts, E. B. Breitschwerdt, R. B. Ford, J. N. Kornegay, C. M. McPherson, E. A. Stone, M. K. Stoskopf; *Adjunct Professors:* S. W. Crane; *Associate Professors:* P. J. Armstrong, C. E. Atkins, S. E. Bunch, D. J. DeYoung, R. B. Ford, T. O. Manning, M. P. Nasisse, E. J. Noga, R. L. Page, D. C. Richardson, M. S. Young; *Adjunct Associate Professors:* D. I. Hammer, K. G. Kagan, N. A. Watson; *Assistant Professors:* D. E. Bevier, M. E. Davidson, K. Flammer, E. M. Hardie, B. W. Keene, S. J. Wheeler; *Adjunct Assistant Professors:* H. M. Aberman, R. J. Bartlett, D. Harling, R. W. Torgerson; *Instructors:* A. L. Hopkins, K. H. Taylor, P. S. Snyder, M. C. McEntee; *Adjunct Instructor:* P. S. Kuder; *Associate Members of the Faculty:* C. F. Abrams, Jr. (Agricultural Engineering).

FOOD ANIMAL AND EQUINE MEDICINE

Professor M. C. Roberts, *Acting Head of the Department*

Professors: H. J. Barnes, J. Fetrow, B. S. Harrington, W. D. Oxender; *Associate Professors:* K. Anderson, K. F. Bowman, F. Hunt, D. Ley, J. Tate, S. Van Camp, D. P. Wages, M. Whitacre; *Adjunct Associate Professors:* S. Galphin, L. Munger, S. Schmittle; *Assistant Professors:* G. Almond, B. Breuhaus, D. Bristol, W. Duckett, M. Ficken, S. Fleming, M. McCaw, B. Slenning, C. Uhlinger; *Research Assistant:* B. Tilley; *Associate Status:* D. Rives (Extension Specialist in Poultry Science).

MICROBIOLOGY, PATHOLOGY, AND PARASITOLOGY

Professor L. Coggins, *Head of the Department*

Alumni Distinguished Professor: R. C. Dillman

Professors: H. A. Berkhoff, T. T. Brown, P. B. Carter, W. T. Corbett, E. V. DeBuysscher, R. C. Dillman, B. Hammerberg, D. J. Meuten, D. J. Moncol, J. Stevens, W. Tompkins; *Adjunct Professor:* J. K. Atwell; *Professor Emeritus:* E. G. Batte; *Associate Professors:* P. Cowen, J. M. Cullen, F. J. Fuller, C. Grindem, J. Guy, J. F. Levine, M. B. Levy, P. Orndorff, S. L. Tonkonogy; *Adjunct Associate Professors:* J. K. Atwell, G. Boorman, J. F. Hardisty, W. F. MacKenize, R. Maronpot, E. E. McConnell, R. Peiffer, J. A. Popp; *Assistant Professors:* R. Cattley, B. Sherry, M. Tompkins, D. Weinstock; *Adjunct Assistant Professor:* R. Cattley, J. Everitt.

OTHER ACADEMIC AND ADMINISTRATIVE UNITS

Music Department

Price Music Center

R. J. Toering, *Director of Music*

Assistant Directors: F. M. Hammond, J. C. Kramer, M. S. Lynch, R. B. Petters, A. E. Sturgis, P. H. Vogel, E. B. Ward: *Musician-in-Residence:* filled by a new appointment each year

The Music Department at North Carolina State University is committed to providing students with a broad-based education that not only prepares students for a career but also supplies them with aesthetic values that stimulate creative activities and enrich their personal lives. Through a variety of musical experiences, the department seeks to help students develop their musical insight, improve their musical skills, and cultivate their ability to perceive and respond to the beauty of music and the excitement it brings to life.

Opportunities for direct student participation as performers include many instrumental and choral organizations, which are described in more detail under "Student Activities." Membership in any musical organization is open to students with a disciplined interest in music. Auditions are scheduled during orientation activities, at the beginning of each academic semester, and by personal appointment with directors of particular musical organizations. For further information, please consult the Music Office.

Academic credit as well as aesthetic appreciation are available through a large number of courses, most of which may be taken to fulfill humanities elective requirements in any undergraduate curriculum. Any of these courses may be taken as free electives. Music Department courses are described in greater detail in the "Course Description" section of the catalog under the indicated course prefix.

The department also serves as a cultural resource for the University community and the public at large through a variety of concerts presented by student musical organizations, departmental performers, and visiting artists. Concerts are open to all students free-of-charge.

Military Education and Training

The Department of Military Science (Army ROTC) and the Department of Aerospace Studies (Air Force ROTC) are separate academic and administrative subdivisions of the institution. Naval Science (Naval ROTC) is available through a cross-enrollment agreement with the University of North Carolina at Chapel Hill. Students in the ROTC programs will receive free elective credit for Aerospace Studies (AS), Military Science (MS), or Naval Science (NS) courses up to the limit of free electives in their curriculum.

DEPARTMENT OF MILITARY SCIENCE (ARMY ROTC)

Professor: Lieutenant Colonel H. K. Fisher, Jr.

Instructors: Captain W. G. Bickel, Captain J. M. Borland, Captain N. A. Fortuin, Captain W. A. Gregory, Captain H. J. Rogers, Captain S. L. Sharp.

Mission. The mission of the Army ROTC Program is to train college men and women to become commissioned officers in sufficient numbers to meet Active Army, Reserve, and National Guard requirements.

Program of Instruction. The Army ROTC program consists of a voluntary six-semester-hour Basic Course (freshmen and sophomore level) and a two-year Advanced Course (junior and senior level) which includes a six week camp in the summer prior to the senior year.

One may enter the Advanced Course without participating in the Basic Course by any of the following methods:

NEW ENTRY OPTION: The Army ROTC New Entry Option is designed for junior and community college graduates, students at four-year institutions who did not take ROTC their first two years of college, and students entering a two-year post graduate course of study. THe New Entry Option offers an opportunity to enhance one's education and graduate with more than a college diploma. Participants receive valuable leadership and management training both in and outside the classroom along with $100 per month. Participants develop new skills and gain the practical experience they need as an officer in the U.S. Army, and in their chosen civilian career. When participants finish the program and complete college, participants receive their first promotion—from student to second lieutenant.

SIMULTANEOUS MEMBERSHIP PROGRAM (SMP): Persons or National Guard may take advantage of this program and, if accepted, enroll directly into the Advanced Course. SMP participants will be assigned to a unit near the school or home for part-time monthly officer training and will receive the ROTC Advanced Course subsistence payment of $100 per month, plus approximately $120 per month for the one weekend of Reserve or Guard training. In addition, two weeks of Annual Training will be required for which the individual will receive full pay.

PRIOR SERVICE: Service veterans are eligible for placement into the Advanced Course.

BASIC SUMMER CAMP: Successful completion of the six week basic summer camp, held at Ft. Knox, Kentucky, is an alternative to the basic course.

TRANSFER CREDIT: Students entering as transfer students from other institutions may receive credit for work completed at other Senior ROTC units.

JUNIOR ROTC: Students who have participated in a Junior ROTC in high school may receive placement credit as determined by the Professor of Military Science.

Eligibility: All full time freshmen and sophomores may enroll in any Military Science Basic Course offering without obligation to the Army. To be eligible for participation in the Advanced Course, applicants must be in good academic standing, physically qualified and demonstrate satisfactory performance in the Basic Course. Additionally, applicants must be able to be commissioned by their 30th birthday; however, an age waiver may be obtained as long as the individual will be commissioned prior to his or her 34th birthday. A student must have a minimum of two years remaining as a full time student at either the undergraduate or graduate level.

Professional Military Electives: There are seven Professional Military Electives which must be taken or an approval obtained of a waiver for them. These electives must be completed or waived prior to commissioning.

Delays for Graduate Study: Qualified ROTC graduates may delay their entry into active service in order to obtain advanced academic degrees. Fellowships for advanced academic study are available to selected ROTC graduates, allowing up to two years of graduate study while receiving full pay and allowances plus payment for tuition, all fees, textbooks and required supplies.

Financial Aid: Army scholarships of two to four years, which pay for tuition, all fees and textbooks, are available on a competitive basis to students who are strongly motivated and academically qualified. Students in the Advanced Course receive a subsistence allowance of $100 per month (tax free) up to a maximum of $2000. All Advanced Course cadets are paid approximately one-half the basic pay of a second lieutenant, while attending the six-week Advanced Camp, plus travel allowances to and from camp.

Service Opportunities: Scholarship recipients may serve four years active duty upon commissioning or eight years in the U.S. Army Reserve or National Guard. Non-scholarship commissioners must serve three years on active duty or eight years with the Army Reserve or National Guard. Service consists of one weekend drill per month and two weeks annual training.

Program Features: Army ROTC classes are unique, offering instruction and a practical, working knowledge of leadership. Students are challenged early in their ROTC training to enable them to develop sound judgement, the desire to achieve, acceptance of responsibility, personal confidence, and to learn the principles of personnel management. The primary vehicle for this training during the academic year is Leadership Laboratory, where cadet officers and non-commissioned officers conduct instruction under the supervision of the Military Science Department's faculty. The intensive summer Advanced Camp is extremely effective in developing one emotionally, mentally and physically. All Army ROTC training is focused on preparing the student to meet the challenges of tomorrow's society, whether in a military or civilian careers.

Distinguished Military Students: The university names outstanding Army ROTC students as Distinguished Military Graduates.

Uniforms: Uniforms for Army ROTC are provided by the federal government.

DEPARTMENT OF AEROSPACE STUDIES (AIR FORCE ROTC)

Professor: Colonel J. T. Ferrell

Instructors: Major R. R. Baker, Captain F. P. Dunlap, Captain G. R. Dennison, Captain R. W. Iseman.

Program. There is a four-year and a two-year program that leads to a commission in the United States Air Force.

The four-year program allows freshman to enroll in Aerospace Studies courses in the same manner as other college courses for the first two years. Students take these courses as free electives and incur no military obligation unless they are receiving an AFROTC scholarship. These first two years are called the General Military Course (GMC). The last two years of AFROTC comprise the Professional Officer Course (POC). Non-AFROTC sophomore students may compete with GMC cadets for a position in the POC and obtain a commission under the two-year program.

The two-year program is available to those who do not take the first two years of Air Force ROTC. Interested students must contact the Professor of Aerospace Studies early in the first semester of their sophomore year. Accepted students will attend a six-week summer field training encampment (two-year program) or a four-week encampment (four-year program) before entering their junior year and the POC.

Students with a pilot allocation usually attend a flight instruction program during the summer following their junior year. This training is very similar to that available for obtaining a private pilot's license. Junior cadets may also apply for other special summer voluntary programs such as USAF Academy Freefall Parachute Training, British (RAF) Exchange Program, Army Airborne Training Program, Strategic Defense Initiative R & D Program, and other specialized professional development programs related to the cadet's future career area.

Upon graduation and satisfactory completion of the POC, the student is commissioned a second lieutenant in the USAF.

Financial Aide. Air Force ROTC students are encouraged to apply for scholarships ranging from two to three and one half years. Scholarships pay for tuition, fees, books, and provide students $100 per month during the academic year for miscellaneous expenses. Scholarships are awarded by the Air Force based primarily on college academic achievement.

Students in the GMC, other than scholarship students, receive no monetary allowance. All POC student receive the $100 per month during the academic year.

Curriculum. The AFROTC educational program provides professional preparation for future Air Force officers. During the first two years, courses will focus on a detailed study of the Air Force mission and organization, other military services, the evolution of Airpower concepts and doctrine, and the history of Airpower employment. During the last two years, the focus will be on leadership and management and an in-depth examination of National Security, American defense strategy and policy, and the methods for managing conflict. Throughout all four years a progressive development of communicative skills is integrated into each course. Officership is developed through leadership laboratory, traditional military social functions, base orientation trips, and cadet-centered programs.

Eligibility. There are no enrollment requirement for the GMC. To enter the POC students must pass an Air Force Officer Qualifications Test, meet physical and academic requirements, and be selected by the Professor of Aerospace Studies and Air Force ROTC headquarters. In addition, student must complete their degree and the POC before their 30th birthday. Veterans may obtain a waiver of maximum nonflying age requirement up to age 35.

Students desiring to enter the four-year program simply register for the freshmen Aerospace Studies course. Other students should contact the ROTC office on campus in Room 141 of Reynolds Coliseum; or write to: Professor of Aerospace Studies, NCSU Box 7308, Raleigh, N. C. 27695-7308.

Organization. The AFROTC unit is organized as a cadet wing staffed entirely by cadets for leadership development. They are assisted and advised by the instructors. Three collateral organizations, Arnold Air Society, Marching Cadet Fraternity, and Angel Flight support the wing organization as well as the university.

Uniforms. Uniforms are provided by the federal government.

NAVAL SCIENCE (NAVAL ROTC) CROSS-ENROLLMENT WITH UNC-CH

Professor: Colonel G. H. Walls, Jr.

Associate Professor: Commander L. R. Corgnati, Jr.; *Instructors:* Major G. A. Clark, Jr., Lieutenant P. R. Dobbs, Lieutenant B. T. Vance, Lieutenant T. J. Block.

Mission. The purpose of the Naval ROTC Program is to provide a source of highly qualified and motivated naval officers, both men and women, to serve on surface ships, in aircraft, in submarines, or in the Marine Corps. Midshipmen who satisfy academic and physical requirements are commissioned as either an Ensign in the Navy or Second Lieutenant in the Marine Corps. Midshipmen are cross-enrolled in the Naval Science Department at UNC Chapel Hill but take all ROTC courses on campus at N.C. State.

4-Year NROTC Program. There are basically two NROTC Programs leading to a commission as a Navy or Marine Officer upon graduation, the Scholarship Program and the College Program.

Scholarship Program. The Scholarship Program leads to a regular commission in the Navy or Marine Corps. For students who receive a Navy/Marine Corps scholarship, the Navy will pay tuition and fees, buy books, supply uniforms, and pay $100 per month tax-free subsistence allowance to help defray the cost of normal board at the university. During the summers between school years scholarship students will receive 4-6 weeks of at-sea training conducted on ships, submarines, and aircraft of the Navy's first line force. Upon graduation and commissioning, the scholarship students are obligated to serve a minimum of four years on active duty.

College Program. For those students who are interested in a reserve commission and do not desire a scholarship, or for those who are seeking an opportunity to qualify for a scholarship after entering NCSU, the College Program is available. Selection for the College Program is made from students already enrolled at NCSU, with applications being accepted and considered by the staff of the NROTC unit. Students enrolled in the College Program are provided uniforms, Naval Science textbooks, and during the final two years of the program, receive a $100 per month subsistence allowance. College Program midshipmen receive a single summer training cruise between their junior and senior year. Except for the administrative differences, no distinction is made between the Scholarship and College Program midshipmen. The minimum active duty commitment following graduation for a College Program student is three years.

Students in the College Program are eligible to compete for scholarships at regular intervals throughout the college year. Most College Program students who have demonstrated above average academic and professional performance in the unit have received scholarships.

Two-Year Programs. The Two-Year Programs offer an opportunity to participate in NROTC during the final two years of university study. Both Scholarship and College Programs exist, offering the same advantages to the student as the respective four-year

programs. Upon selection, the candidate attends a six-week training course at Newport, Rhode Island, during the summer between the sophomore and junior years so that he or she may receive instruction in the Naval Science subjects normally covered in the first two years at the unit. Participants in this training course receive uniforms, rooms, board and officer candidate pay during the period and, upon satisfactory completion of training, enter the NROTC program as third year students. Applications for this program must be completed by March 15 prior to the starting year.

The Marine Option. A limited number of quotas are available for students who wish to enter either of the NROTC Programs as Marine Officer candidates. For others who may decide upon a Marine Corps commission after joining NROTC, selection for the Marine Option may be made in the sophomore year. A midshipman's status as a Marine Option will result in some modifications as to curriculum and the final summer training period.

Curriculum. Due to the increasingly advanced technologies being employed by the Navy, candidates for regular Navy Commissions are being encouraged to select academic majors in mathematics, engineering, and scientific disciplines. However, each student in the NROTC program is free to choose his area of major study.

The NROTC training program emphasizes military indoctrination, physical fitness, and academics. All required NROTC courses are fully accredited and taken for free elective credit. Additional university courses may be required depending upon one's major; however, all Navy option scholarship midshipmen must complete one year of calculus and physics. In addition to the courses taken for university credit, midshipmen will attend one laboratory/drill period each week.

Midshipmen Life. Academic excellence is emphasized throughout the NROTC Program with commensurate participation in the full range of campus, extra curricular activities. Additionally, midshipmen have opportunities to examine all aspects of life in the Navy and Marine Corps through field trips, summer cruises, sail training, social activities, and participation in the midshipmen military organizations.

Further information regarding application for and admission into the N.C. State Naval ROTC may be obtained on campus in Room 205 Peele Hall or by writing to the Professor of Naval Science, Box 7310, NCSU, Raleigh, N.C., 27695.

Graduate School

Peele Hall

D. W. Stewart, *Dean*

E. M. Crawford, *Associate Dean*

D. A. Emery, *Associate Dean*

T. Melton, *Associate Dean*

The Graduate School provides instruction and facilities for advanced study and research in the fields of agriculture and life sciences, design, education and psychology, engineering, forest resources, humanities and social sciences, physical and mathematical sciences, textiles and veterinary medicine.

The school is currently composed of more than 1,700 graduate faculty members within the nine colleges. Educated at major universities throughout the world and established both in advanced teaching and research, these scholars guide the university's graduate student body of some 3,800 men and women from all areas of the United States and about 90 other countries.

The faculty and students have available exceptional facilities including libraries, laboratories, modern equipment and special research areas.

For a list of graduate degrees offered at North Carolina State University and details on programs and admissions, consult the *Graduate Catalog.*

Adult Credit Programs and Summer Sessions

J. F. Cudd, *Director*

The **Office of Adult Credit Programs** registers and provides student services to Undergraduate Studies (UGS) and Post-Baccalaureate Studies (PBS) students who enroll in the university's regularly scheduled day and evening classes. These non-degree students may take any course offered by the university, provided they satisfy any required prerequisites and space is available. Late afternoon and evening courses are offered primarily for the benefit of adults who are unable, because of time limitations, to attend day courses. Each semester, over 300 afternoon and evening courses are offered in over 45 subject areas. Twelve undergraduate and ten graduate degrees may be completed by individuals enrolled solely in evening classes. Approximately 4,000 UGS and PBS students enroll each semester.

Using a variety of delivery systems, classes are offered across the state and throughout the U.S. Methods include traditional, face-to-face instruction, as well as courses offered by various telecommunication mechanisms. Total enrollment in off campus credit courses for 1989-1990 was 2,746.

More than 40 courses in 19 subject areas are offered through the Independent Study (correspondence) Program. Administration of the program is handled by the Office of Independent Study of the Division of Extension and Continuing Education at UNC-Chapel Hill. Television based home study courses are occasionally offered in conjunction with the UNC-TV Network.

The **Summer Sessions** at North Carolina State University offer an extensive educational program planned to meet the varied needs and interests of approximately 14,000 students. Sixty departments offer instruction in more than 700 courses, approximately 90% of which are at the undergraduate level. Each of the university's nine colleges and schools, with a combined faculty of more than 500, participates in the summer sessions. The schedule includes two "regular" five week sessions, a ten-week session, and a three-week institute for adult and extension educators, as well as several dozen evening courses scheduled for the convenience of working adults.

Summer courses and special programs are designed for the new student, the undergraduate wanting to advance his or her academic standing at State, the graduate desiring to continue study and research during the summer months, and visiting students pursuing degrees at other institutions. Teachers who need to earn credit toward renewal of teaching certificates or advanced degrees in education and persons in professional fields who wish to keep abreast of new developments and trends also take advantage of State's summer programs.

For information regarding summer activities write: Director of Summer Sessions, Box 7401, Raleigh, North Carolina 27695-7401.

University Extension and Public Service

Jane S. McKimmon Center

A. L. White, *Interim Vice Chancellor for Extension and Public Service*

S. L. Kirsch, *Interim Associate Vice Chancellor*

Campus-wide coordination and communications for extension, public service and continuing education activities are provided through the office of the Vice Chancellor for Extension and Public Service. In carrying out these responsibilities, the division provides

assistance in the identification of educational needs for individuals and groups throughout the state, program development and implementation, program evaluation, and statewide coordination with the constituent members of the University of North Carolina. The vice chancellor is assisted in his campus-wide responsibilities by the University and Public Service Advisory Council and the Extension, Lifelong Education and Instructional Television Committee of the University, which are composed of faculty and staff representatives from each of the colleges and schools.

The vice chancellor acts as an advocate for extension and provides support for interschool programs, centers and other multidiscipline resources of the university to meet the lifelong education, public service, and technical assistance needs of the citizens of North Carolina.

OFFICE OF CONTINUING EDUCATION AND PROFESSIONAL DEVELOPMENT

Edgar B. Marston, *Director*

Continuing Education Specialists: D. Shell, C. McElroy, L. Ray, A. S. Warren, B. Winston, M. Hall, A. Coughlin.

In keeping with the land grant tradition of the university, the Office of Continuing Education and Professional Development provides education and training to all the people. Programs covered include: agriculture, communication, data processing, economics, education, engineering, forestry, management, the physical sciences, recreation, textiles, and veterinary medicine. Special efforts are made to meet the training needs of industry and government agencies. More than 900 courses are offered with registrations totalling over 27,000.

The university awards Continuing Education Units to participants in qualified programs. Continuing Education Units are part of a nationwide recording system to provide a uniform measure of attainment in noncredit educational programs. One CEU is defined as "ten contact hours of participation in an organized continuing education experience under responsible sponsorship, capable direction and qualified instruction."

Also available during evening hours is the General Interest Course program, which is made up of avocational, cultural and professional development noncredit courses. Over 150 courses are offered, reaching thousands of individuals.

CENTER FOR URBAN AFFAIRS AND COMMUNITY SERVICES

P. Meyer, *Director*

Group Managers: Y. S. Brannon

The Center for Urban Affairs and Community Services brings the research, educational, and extension resources of NCSU to bear upon community problems associated with urbanization in North Carolina. In addition to providing direct services, such as applied research, education, and technical assistance, to local and state governments in the areas of social sciences, human services, policy analysis, and evaluation research, the center also: (1) provides experiential educational opportunities for graduate and undergraduate students and (2) develops and supports research opportunities for faculty and upper-level graduate students.

The Center for Urban Affairs and Community Services coordinates its work with other members of the University of North Carolina's Urban Studies programs through the Urban Studies Council. The council enables universities and other institutions across the state to pool their efforts to encourage productivity and responsiveness of government and community institutions.

EMERGING ISSUES FORUM

B. Owen, *Director*

The Emerging Issues Forum provides an important arena for bringing together top-level leaders from government, business, education, and the scientific community to discuss and debate the most critical issues of our time, to question conventional wisdom, and to test new ideas. The forum supports NCSU's unique role in relation to major American industries by serving as a catalyst for framing questions and suggesting answers in the world arena of economic and technological developments. The forum generates the kind of public policy debate that relates to jobs, opportunities, education, and quality of life and, at the same time, the forum endorses as top national priorities the concepts of innovation and competitiveness.

INSTRUCTIONAL TELECOMMUNICATIONS

T. L. Russell, *Director*

Academic credit courses are not offered for distant learners by way of instructional television. Selected courses from the colleges of Engineering, Humanities and Social Sciences, Physical Science and Mathematics, and Textiles are held in studio/classrooms for live transmission or videotaped delivery to off campus students. Currently, courses are delivered by cable television public access and ITFS in the Raleigh/Wake County/Research Triangle Park areas, by microwave interconnecting major university campuses in the state, by satellite to students of the National Technological University, and by videocassette throughout North Carolina and beyond.

INTERNATIONAL TRADE CENTER

T. R. Brown, *Director*

The International Trade Center offers programs to upgrade and improve the skills of executives, managers and professionals whose work involves international trade. Practical, in-depth seminars, workshops, short courses, and trade conferences provide instruction in areas of identified need, such as marketing, export, finance, documentation, and a variety of other aspects of world trade. The center offers briefings and updates on key markets abroad. The International Trade Center arranges specially designed in-house programs for individual companies and business groups. The Special International Luncheon Series brings international leaders to the area, providing timely and authoritative information on important international business and trade topics. Acting as a resource, the I.T.C. identifies and recruits speakers and instructors to address topical issues on international business, i.e. finance, law, governments, culture, countertrade, joint ventures, infrastructure, logistics, etc. With their experience and background, these experts provide the guidance and down-to-earth advice to meet current needs. International Trade Center programs attract a diverse group of people, including those from business and industry; professional firms; banks; service organizations; federal, state, and local government; and educational institutions. As a result of the expanded participation of North Carolina businesses in international markets, the International Trade Center is currently participating in the development of a World Trade Center for the Raleigh area which will underpin the international programs of area universities with business and industry acumen.

JANE S. McKIMMON CENTER FOR EXTENSION AND CONTINUING EDUCATION

D. S. Jackson, *Director*

The Jane S. McKimmon Center serves as the premier adult education facility in North Carolina. It provides program support services in pleasant surroundings conducive to the interchange of ideas and information. In the fourteen years since opening in June, 1976, the

center's sixteen conference rooms have been used for 15,350 educational meetings—bringing a total of 972,000 adults from all walks of life to our campus for participation in an education activity.

University Libraries

S. K. Nutter, *Director*

D. S. Keener, *Assistant Director for Administrative Services*

S. S. Striedieck, *Assistant Director for Technical Services and Collection Management*

C. L. Gilreath, *Assistant Director for Public Services*

J. Y. Davis, *Assistant Director for Planning and Development*

J. E. Ulmschneider, *Assistant Director for Library Systems*

The NCSU Libraries consist of the D. H. Hill Library and its branch libraries. They contain more than 1.2 million volumes of books and bound journals, 800,000 federal government publications, and more than 3 million microforms. The collections are particularly strong in the biological and physical sciences, engineering, agriculture, forestry, textiles and architecture, with the arts, humanities and social sciences also well represented. The Libraries regularly receive more than 19,000 serials. Five special libraries—the **Burlington Textiles Library** in Nelson Hall, the **Harrye B. Lyons Design Library** in Brooks Hall, the **Natural Resources Library** in Jordan Hall, the **Veterinary Medical Library** in Veterinary Medical Building and the **Curriculum Materials Center** in Poe Hall—serve the special needs of their respective school and colleges.

The NCSU Libraries have been a depository for U.S. government publications since 1924 and receives over 88 percent of these publications. The Libraries also receive the microfiche research reports published by the Department of Energy, the National Aeronautical and Space Administration (NASA), the Educational Resources Information Center (ERIC), and the National Technical Information Services (NTIS).

The BIS online, computer-based author, title and subject catalog permits rapid identification of monographs and serials in the collections of the NCSU Libraries as well as those of Duke University and UNC-Chapel Hill. This resource sharing greatly enhances the research capabilities of the NCSU Libraries. This is made possible through the Libraries' participation in the Triangle Research Libraries Network (TRLN). An automated circulation system introduced in 1990 provides quick, easy check-out of books by borrowers.

A number of bibliographic and full-text databases are available in CD-ROM format for searching by users at no charge. These databases cover fields such as engineering, agriculture, education, business, and patent literature. In addition, the Libraries provide staff-assisted searching of hundreds of other online databases on a cost-recovery basis.

Facilities and equipment are also available for both individual and group use of audio-visual media. The library's theatre can be scheduled for group media presentations, and films in the State Library's film collection can be borrowed by the D.H. Hill Library's Media Center for academic use by faculty and students. The Media Center is equipped with audio and video equipment for group and individual viewing and listening. The library has a growing collection of video and audio cassettes for individual and class use.

CURRICULUM MATERIALS CENTER

M. A. Link, *Coordinator*

C. A. Cranford, *Assistant Coordinator*

The Curriculum Materials Center, administered by the College of Education and Psychology, is located in 400 Poe Hall. The center maintains a collection of education materials

with particular emphasis on teaching methods, research, administration and psychology and includes films, filmstrips, slides, audiotapes, video cassettes, simulation games, and computer software. Audiovisual equipment is available for previewing materials in the center. The center acquires textbooks adopted by the State Board of Education for secondary level subjects as well as other selected textbooks and reference materials. The mission of the center is to support programs in the College of Education and Psychology. Lending policies permit the use of certain materials by the larger campus community for instructional and research purposes.

University Computing

H. E. Schaffer, *Associate Provost for Academic Computing Services*

H. L. Buckmaster, *Director, Administrative Computing Services*

C. W. Malstrom, *Director, Computing Center*

The Computing Facilities at NCSU include a major mainframe installation and a large collection of computing resources, both in the central facilities of the Computing Center, and distributed on campus, serving the academic and administrative functions of NCSU. These components are interconnected by a comprehensive data communications network which also connects to the Concert, Bitnet, SURAnet/Internet and usenet networks. NCSU is also a participant in the North Carolina Supercomputing Center, in the Research Triangle Park, which is on the Concert network and which has a CRAY Y-MP supercomputer, a Convex C-2 mini-supercomputer, an IBM 3090/170J, and visualization facilities.

The major computers in the Computing Center are an IBM 3090/180J shared between academic computing and administrative data processing, and IBM 4381 and DEC VAX8700 computers for academic use. The Computing Center also provides a large selection of central services including terminal facilities, consulting, user support from supercomputers to microcomputers, data communications, and repair facilities for microcomputers and terminals. The Computing Center is a Smart Node of the Cornell National Supercomputer Facility. The IBM, VAX and other equipment is used to provide a variety of network services including protocol conversion for such protocols as SNA, DECnet, TCP/IP, Token Ring and RSCS. The Computing Center has responsibility for several data communications networks including a large broadband cable system, a large data switch, an optical fiber backbone and various other low, medium and high speed communication media.

All of these facilities, and other networked resources including the library on-line catalog and a campus information resource, can be reached via dial up lines and over the data communications networks provided on the campus. Access can be via data terminals and by personally owned microcomputers which are also used by themselves for word processing, scientific computation, etc.. The NCSU Bookstores provide an opportunity for students to purchase microcomputers and software at low academic prices.

Additionally, many departments provide student access to networked minicomputers, microcomputers, workstations, and dedicated minicomputers. Particularly notable is Project Eos in the College of Engineering, which is intergrating NCSU provided engineering computing workstations into undergraduate education.

Research Triangle

The unique "Research Triangle" in North Carolina has captured national and international attention. It is comprised of the Research Triangle Park, a world reknowned research park, and three major research universities. Because of this wealth of educational

and research opportunities, the Triangle area contains the highest total of Ph.D. scientists and engineers per capita, in the nation. The Triangle Universities—NCSU, the University of North Carolina at Chapel Hill, and Duke University—have a subsidiary campus in the Research Triangle Park—the Research Triangle Institute. The Institute, which operates as a contract research organization, has an annual research revenue of approximately $100 million.

The Research Triangle Park, founded in 1959, now has more than 55 public and private industrial research facilities, situated on 6,800 acres of land. Over 33,000 people work in the Park and over 52,000 additional jobs have been created outside the Park as a result of its existence. Organizations in the Park include such government facilities as the National Humanities Center, the National Institute of Environmental Health Sciences, the Environmental Protection Agency, and the National Center for Health Statistics. Private companies such as Glaxo Pharmaceuticals, Northern Telecom and Reichhold Chemicals have their North American headquarters in the Park. Two major, state-supported research initiatives in Microelectronics and Biotechnology are located in the Park and North Carolina's new $18 million Supercomputing Center is housed there as well. Faculty and graduate students from the universities work closely with many of the Park companies. Scientists and researchers from companies like Burroughs Wellcome, IBM, and Becton-Dickinson frequently hold adjunct appointments in one or another of the Triangle Universities.

Research Centers and Facilities

BIOLOGY FIELD LABORATORY

P. D. Doerr, *Director*

The Biology Field Laboratory is located six miles from the university campus and comprises two small streams, a 20 acre pond, 50 acres of varied terrestrial habitats and several laboratory buildings. The facilities, used for laboratory and field instruction and for undergraduate, graduate and faculty research, is particularly suited for use by advanced classes in several biological science departments. Qualities that make the Field Laboratory an attractive teaching and research site include habitat diversity, restricted public access and proximity to the campus.

CENTER FOR ADVANCED ELECTRONIC MATERIALS PROCESSING (AEMP)

N. A. Masnari, *Director*

The Advanced Electronic Materials Processing Center was established in 1988 as one of the prestigious NSF Engineering Research Centers. The center's program is interdisciplinary and involves collaboration among chemists, physicists, materials scientists, and electrical, computer and mechanical engineers. The research focuses on the development of electronic materials processing technologies that will provide the capability of producing submicron electronic devices. The program emphasizes low-temperature processes using plasma and thermal and optically assisted techniques as well as the automation and control of those processes. It is a joint effort with researchers from the University of North Carolina (Chapel Hill and Charlotte), Duke University, North Carolina A&T State University, Research Triangle Institute, and the Microelectronics Center of North Carolina.

CENTER FOR ASEPTIC PROCESSING AND PACKAGING STUDIES

Kenneth R. Swartzel, *Director*

The Center for Aseptic Processing and Packaging Studies was established in October 1987 to promote cooperative research between university and industrial researchers and to further scientific knowledge in areas of food and pharmaceutical aseptic processing and packaging. The center is funded by the National Science Foundation, North Carolina State University, and industrial members from food, pharmaceutical, and packaging industries. Current members include Fluor Daniel, the Food and Drug Administration, International Paper Company, John Labatt Foods, Kraft General Foods, the North Carolina Biotechnology Center, Nestle, Ross Laboratories, and USDA-Agricultural Research Service. The objectives of the center are to support industrially relevant, fundamental research in aseptic processing and packaging, to enhance product quality and improve efficiency, and to communicate information gained from basic research to industry for development and marketing.

Graduate students working on CAPPS projects will be exposed to industrial concerns and given the opportunity to work first-hand with industry in solving problems and making practical application of their research. The research involves faculty, visiting scientists, graduate students and technicians from the Departments of Food Science and Biological and Agricultural Engineering. Other universities participating in the research include Michigan State University, North Carolina A&T and State University, The Ohio State University, and Virginia Polytechnic Institute and State University.

CENTER FOR COMMUNICATIONS AND SIGNAL PROCESSING

Arne A. Nilsson, *Acting Director*

In 1981, the National Science Foundation selected North Carolina State University as a site for an industry/university cooperative research Center for Communications and Signal Processing (CCSP). As of June 1989, CCSP members are: AT&T, BellSouth, Digital Equipment Corp., General Electric Co., International Business Machines, Kodak, and Northern Telecom/BNR. CCSP has achieved national and international recognition as a center of excellence in communications and signal processing research. The objectives of the center are to conduct basic and applied research that can lead to products and services in the communications and signal processing fields and to strengthen industry/university relationships. In addition to providing useful research services to industrial participants, the center enhances the education of graduate students by providing them with practical, relevant research topics and the means for carrying out their research.

CENTER FOR OCCUPATIONAL EDUCATION

G. E. Moore, *Acting Director*

Established as a vocational education research and development center in 1965 under the provisions of the Vocational Education Act of 1963, the Center for Occupational Education, an integral unit within the College of Education and Psychology, was founded on the principle that the problems facing occupational education are so varied that no single field of research or single disciplinary orientation has the capability of providing all the answers. Studies and conferences in occupational education planning, work analysis, evaluation, labor and economics, policy analysis, personnel and leadership development, and education have been included in the center's program. The center's programs are financed largely by grants and contracts from federal and state agencies.

CENTER FOR RESEARCH AND DEVELOPMENT IN MATHEMATICS AND SCIENCE EDUCATION

S. B. Berenson, *Director*

The center, one of ten centers in the North Carolina Mathematics and Science Education Network, is the only research and development center in the network. Established within the Department of Mathematics and Science Education in 1984, the center conducts research and development activities for precollege students, preservice teachers, inservice teachers, and university faculty. The center identifies areas of need in mathematics and science education and forms partnerships with federal, state, local and private funding agencies to work collaboratively to address the needs. Grants have been obtained from the National Science Foundation, Office of Education, State Department of Public Instruction, Local Education Agencies, the Ford Foundation, and IBM to introduce changes that incorporate technology and active learning into the mathematics and science curriculum, K-16. In addition, the center supports graduate students and provides them with opportunities to write grants and to design, conduct, and report on educational research.

CENTER FOR SOUND AND VIBRATION

R. F. Keltie, *Director*

The Center for Sound and Vibration, established in 1969 and administered within the Department of Mechanical and Aerospace Engineering, comprises faculty pursuing the solution to a wide variety of vibration and sound problems occurring in machinery and aircraft design. Graduate programs exist at M.S. and Ph.D. levels in such fields as noise and vibration control, structural acoustics, aeroacoustics, hearing conservation, computer-aided machinery design, architectural and musical acoustics, and acoustic signal processing. Outstanding experimental facilities, which include large anechoic and reverberant rooms and computer graphics equipment, are available. The center's programs are financed largely by grants and contracts from industry and federal and state agencies.

ELECTRIC POWER RESEARCH CENTER

J. J. Grainger, *Co-Director, Electrical Area*
P. J. Turinsky, *Co-Director, Nuclear Area*

The Electric Power Research Center, established in 1985 within the NCSU College of Engineering, is supported via membership fees, enhancement grants and normal research contracts by organizations from the various sectors of the electric utility and power industry, including national laboratories and private interests. The purpose of the center is to collaborate in enhancing the excellence of a wide range of research and graduate-level degree programs in electric power system from power generation to end usage. This primary purpose is accomplished by supporting interested faculty and students' involvement in basic and applied research directly relevant to the needs of the multifaceted electric power industry. Motivation to work with the center derives from the close university/membership interaction, the leverage afforded members via pooled resources, and the enhanced professional and research opportunities provided to faculty and students in electric power engineering.

The current research program involves faculty from the Department of Electrical and Computer Engineering. However, the center facilitates access by all sectors of the electric power industry to the various resources of the university.

ELECTRON MICROSCOPE FACILITIES

There are four electron microscope facilities at N.C. State available to graduate students and faculty for research purposes. The College of Agriculture and Life Sciences Center for Electron Microscopy is located in Gardner Hall, the Engineering Research Microscope Facility is in Burlington Engineering Labs and the Department of Wood and Paper Science Electron Microscopy Lab is in Biltmore Hall. The new SVM Electron Microscopy Labora-

tory is located in the North Carolina State University School of Veterinary Medicine at 4700 Hillsborough Street in Raleigh.

J. M. MacKenzie, Jr., *Coordinator, CALS Center for Electron Microscopy*

The CALS Center for Electron Microscopy has a Philips 400T transmission electron microscope with STEM capabilities and computer control. In addition, three other transmission microscopes—a JEOL 100-S, a Hitachi HU11-B, and a Hitachi HS-8—are used for teaching and research. There are two scanning electron microscopes in the facility—a Philips 505T with computer control and JEOL T200. The center is fully equipped for a range of biological specimen preparations and also has two darkrooms.

Formal instruction is provided through the biological sciences curriculum and includes specimen preparations, use of the microscopes, and production of electron micrographs. Over the next several years, the center will be experimenting with short, intensive five- and six-week courses in transmission/ultramicrotomy and scanning respectively. In addition to its training function, the center instituted a complete service program in 1989.

E. M. Gregory, *Supervisor, Engineering, Analytical Instrumentation Facility*

The Engineering Research Analytical Instrumentation Facility is equipped with a scanning auger microprobe, an ion microscope, a 200kv analytical scanning transmission electron microscope (STEM), and a computer-controlled scanning electron microscope (SEM), the latter two equipped with energy dispersive X-ray analysis systems. These are suitable for examination of metallurgical, ceramic and electronic materials, textiles and organic specimens. The high voltage STEM enables the researcher to examine thicker specimens. The X-ray analytical capability is used in conjunction with high resolution imaging for qualitative and quantitative elemental analysis of small amounts of materials (down to cubic microns in bulk materials and a few hundred nanometers in thin samples). The scanning auger microprobe is capable of surface analysis of the top 3 atomic layers of a solid material in an area of 50 to 100 nanometers. The auger microprobe is equipped with an argon ion gun so that depth profiling may be done through thin films. The ion microprobe can perform elemental and isotope analysis to monolayer depths, with a lateral resolution of one micrometer. It can also do depth profiling, especially important for implanted semiconductors. The facility is completely equipped for specimen preparation and technical photography in the physical sciences, is representative of the best modern microanalysis instrumentation, and is unique in this geographical area.

E. A. Wheeler, *Coordinator, WPS Microscopy Lab*

The Department of Wood and Paper Science Microscopy Lab is equipped with a Siemens Elmskop-1A transmission electron microscope as well as equipment necessary for the preparation and study of specimens with light microscopy.

M. J. Dykstra, *Director, SVM Electron Microscopy Laboratory*

The CVM Electron Microscopy Laboratory is a facility housing a Philips 410 LS transmission electron microscope for biological specimens and a JOEL JSM-35 scanning electron microscope. All the back-up equipment for preparing specimens to be viewed with either instrument are housed within the laboratory as well as complete darkroom facilities for the preparation of routine and publication materials.

HIGHLANDS BIOLOGICAL STATION

R. C. Bruce, *Director*

As an institutional member of the Highlands Biological Foundation, Inc., North Carolina State University helps support the Highlands Biological Station, an inland field station located 3,823 feet above sea level in the heart of North Carolina's southern Appalachians. The area has an extremely diverse biota and the highest rainfall in the eastern United States.

Facilities are available throughout the year for pre- and post-doctoral research in ecology, botany, zoology, soils and geology. Field-oriented research is supported by a laboratory building with research rooms and cubicles, a well equipped library, and five cottages and a dining hall located on the edge of a six-acre lake. The station owns 16 acres surrounding the lake as well as several tracts of undisturbed forested land. Research grants available through the station provide stipends for room, board, and research expenses.

INSTITUTE OF STATISTICS

D. L. Solomon, *Director*

The Institute of Statistics is composed of two sections, one at Raleigh and the other at Chapel Hill. At North Carolina State University, the institute provides statistical consulting services to all branches of the institution, sponsors research in statistical theory and methodology, and coordinates the teaching of statistics at the undergraduate and graduate levels. The instructional and other academic functions are performed by the Department of Statistics, which forms a part of the institute.

INTEGRATED MANUFACTURING SYSTEMS ENGINEERING INSTITUTE

C. F. Zorowski, *Director*

The Integrated Manufacturing Systems Engineering Institute was established at North Carolina State University in 1984 to provide a multifaceted educational, research, and technology transfer inititative in manufacturing systems engineering. The objectives of this program are to educate engineers in the theory and practice of advanced design and manufacturing methods at the master's degree level; to conduct basic and applied research on topics related to contemporary manufacturing problems; and to engage in technology transfer to increase productivity and improve the quality of manufactured products.

The central goals of the institute are to integrate computer-aided processes into the design and control of manufacturing facilities enabling them to produce manufactured goods of improved quality at lowered cost. Through both internally and externally funded research projects the institute helps solve generic manufacturing systems engineering problems and provides a vehicle for technology transfer.

MARS MISSION RESEARCH CENTER

F. R. DeJarnette, *Director*

The Mars Mission Research Center is one of nine University Space Engineering Research Centers established by NASA to broaden the nation's engineering capability to meet the critical needs of the civilian space program. The goal of the center is to focus on educational and research technologies used in the design of spacecraft for planetary exploration with particular emphasis on Mars. It is a cooperative program involving faculty, undergraduate, and graduate students at North Carolina State University and N. C A&T State University. The research is a cross-disciplined program involving (1) hypersonic aerodynamics and propulsion, (2) composite materials and fabrication, (3) light-weight structures, and (4) spacecraft controls. Students and faculty conduct part of their research at NASA Centers and participating industries.

MATERIALS RESEARCH CENTER

R. F. Davis, *Director*

The Materials Research Center was established in 1984 at NCSU as an interdisciplinary program involving persons representing the Departments of Chemistry, Electrical and Computer Engineering, Materials Engineering and Physics. The principal thrust area of

the center involves fundamental studies in the epitaxy of compound semiconductors. The center serves as a focal point for this cooperative research. However, the experimental efforts are conducted within the four departments noted above.

MICROELECTRONICS CENTER OF NORTH CAROLINA

A. Reisman, *Vice-President for Semiconductor Research and Technology*

North Carolina State University is a participating member of the Microelectronics Center of North Carolina (MCNC) which has been established to support the academic and research programs in microelectronics. Other participating institutions are the University of North Carolina at Chapel Hill, Duke University, North Carolina Agricultural and Technical State University, the Research Triangle Institute and the University of North Carolina at Charlotte.

MCNC consists of a Semiconductor Research and Integrated Circuit Design and Fabrication Facility located at the Research Triangle Park near Raleigh and a teaching and research Integrated Circuit Fabrication Facility located on the NCSU campus. These facilities are dedicated to the support of VLSI (Very Large-Scale Integration) microelectronics teaching and research programs at the participating institutions. Faculty and students at NCSU have access to the use of MCNC facilities on sponsored research projects and for formal academic courses including microelectronics design and fabrication laboratories. Areas of interest include system design, systems engineering, integrated circuit technology, semiconductor materials and device physics. Departments at NCSU which are actively involved in the program include Electrical and Computer Engineering, Computer Science, Physics, Chemistry, and Materials Engineering.

NORTH CAROLINA JAPAN CENTER

J. Sylvester, Jr., *Director*

The North Carolina Japan Center was established in 1980 at North Carolina State University to strengthen academic, scientific, economic, and cultural ties between Japan and North Carolina. The center also helps conduct the formal exchange NCSU has with Nagoya University, a major national scientific university in Japan.

Under the North Carolina Japan Fellows program, 41 professors and staff have taken a year of Japanese language training and then worked in Japan for a half year with Japanese colleagues in their specialty. They use their Japanese experience in their teaching and research, and they participate in the activities of the center and of the state in its relations with Japan.

The center offers introductory and advanced levels of Japanese language for students and gives special seminars for businessmen and others interested in Japan. Public lectures are given on Japan by members of the staff and the Fellows. Various films dealing with modern Japan, and North Carolina's ties with Japan have been prepared for teacher training, public television, and Japanese companies interested in investment in North Carolina. The center has raised an endowment in memory of former Provost Harry Kelly and his contribution to US-Japan scientific ties. The funds are used for scholarships for NCSU students to take special intensive programs in the Japanese language. The center also works with American companies selling to Japan and Japanese firms locating in North Carolina.

NUCLEAR SERVICES DIVISION

J. N. Weaver, *Manager*

Specialized nuclear service facilities are available to the university faculty, students, state and federal agencies, and industry. The purpose of these facilities is to further the use of nuclear energy in engineering research and in scientific and public service programs. The facilities include: a 1 megawatt steady-state, pool-type, research reactor (PULSTAR) with a variety of test facilities; a neutron activation analysis and radioisotope laboratory equipped with two ND6700 Gamma Spectrometry Systems coupled to ten GeLi solid-state

detectors, two LEPD detectors and two 5″ NaI detectors; a prompt gamma facility; a neutron depth profile facility; a neutron radiography facility, a low level counting laboratory equipped with liquid scintillation systems, radon systems, alpha spectrometry systems and an oxidizer; intermediate hot laboratories with hoods, junior caves and glove boxes; transuranic nuclear materials laboratory and computing and photographic rooms.

The 50,000 square-foot Burlington Engineering Laboratories complex houses the Department of Nuclear Engineering and the Department of Materials Science and Engineering with their associated offices and laboratories. All of the facilities including the reactor are on the North Carolina State University campus.

PESTICIDE RESIDUE RESEARCH LABORATORY

T. J. Sheets, *Director*

The Pesticide Residue Research Laboratory is a facility in the College of Agriculture and Life Sciences devoted to research on pesticide residues in animals, plants, soils, water and other entities of man's environment. Although the laboratory is administered through the Department of Toxicology, it provides pesticide residue analyses for research projects in all departments of the college.

Not only does the laboratory perform interdepartmental residue research, but faculty in the laboratory also conduct independent pesticide research on persistence and decomposition in soils and plants, absorption and translocation in plants, distribution in environment, and contamination of streams, estuaries and ground water.

PLANT DISEASE AND INSECT CLINIC

R. K. Jones, *Director*

The Plant Disease and Insect Clinic (PDIC) provides a unique diagnostic and educational service to plant growers in North Carolina. It is an integral part of the extension program in the Plant Pathology and Entomology Departments. The PDIC receives approximately 7,000 problem samples each year. County Agents, Extension Specialists and growers submit samples from agricultural crops, forests, urban gardens, house plants, etc. This provides an opportunity to observe and work with practical problems currently developing and causing damage.

There are constant and increasingly rapid changes taking place in agricultural technology. These changes require new types of assays and more sophisticated laboratory examinations. Plant problems must be correctly diagnosed and proper control strategies employed as quickly as possible for growers to minimize losses. The PDIC provides a vital link between the numerous highly specialized resources and faculty members at NCSU and the practical plant problems in the field. New or unusual outbreaks of plant diseases and insects can be quickly detected through the PDIC.

PRECISION ENGINEERING CENTER

Thomas A. Dow, *Director*

The Precision Engineering Center, established in 1982, is a multidisciplinary research and graduate education program dedicated to providing new technology for high precision manufacturing. Current work involves the fabrication and assembly of optical systems used in such products as cameras, copy machines, laser bar-code scanners, and compact audio discs. Progress in precision is largely due to improvements in the ability to measure and control using high speed digital computers. The Precision Engineering Center attempts to integrate the measurement function into the manufacturing process. Skilled faculty, combined with government and industry support help the center develop new products that boost productivity and improve the manufacturing base of the country.

REPRODUCTIVE PHYSIOLOGY RESEARCH LABORATORY

L. S. Bull, *Director*

The Reproductive Physiology Research Laboratory, administered through the Department of Animal Science, conducts research on animals used in studies on reproduction. Facilities and equipment are available for surgery, in vitro growth of embryos, micromanipulation and transfer of embryos between females. Recent emphasis has been on teaching and research in the area of mammalian biotechnology.

SEA GRANT COLLEGE PROGRAM

B. J. Copeland, *Director*

The University of North Carolina Sea Grant College Program is a state/federal partnership program involving all campuses of the UNC system. A majority of its activities, however, are conducted at N.C. State University. Sea Grant combines the university's expertise in research, extension and education to focus on practical solutions to coastal problems. Graduate and undergraduate research opportunities rest with individual project directors on campus and with a special fellowship program administered by the program office.

SOUTHEASTERN PLANT ENVIRONMENT LABORATORY—PHYTOTRON

R. J. Downs, *Director*

The Southeastern Plant Laboratory, commonly called a phytotron, is a laboratory especially designed for research dealing with the response of biological organisms to their environment. The high degree of control makes it possible to duplicate any climate from tropical rain forests to arid desert.

The North Carolina State unit concentrates on applied and basic research related to agricultural problems encountered in the southeastern United States, However, the ability to control all phases of the environment allows inclusion of research dealing with all aspects of plant science.

The facilities are available to the resident research staff, participants in North Carolina State's graduate research program and to domestic and foreign visiting scientists.

TRIANGLE UNIVERSITIES NUCLEAR LABORATORY

E. G. Bilpuch, *Director*

TUNL is a laboratory for research in nuclear physics. Located on the campus of Duke University in Durham, the laboratory is staffed and operated by faculty members and students from the physics departments of Duke University, the University of North Carolina at Chapel Hill, and North Carolina State University. A variety of pure and applied research is performed, at lower energies with a small accelerator, and up to 17 MeV with a Tandem Van de Graaff accelerator. Extensive supporting facilities are available: on-line computers, polarized targets, polarized and pulsed beams, and ultra-high beam energy resolution. There is extensive collaboration with the numerous domestic and foreign visiting scientists.

WATER RESOURCES RESEARCH INSTITUTE

D. H. Moreau, *Director*

The Water Resources Research Institute is a unit of the University of North Carolina System and is located on the campus of North Carolina State University.

The institute was established to promote a multi-disciplinary attack on water problems, to develop and support research in response to the needs of North Carolina, to encourage

strengthened educational programs in water resources, to coordinate research and educational programs dealing with water resources, and to provide a link between the state and federal water resources agencies and related interests in the university.

Research and educational activities are conducted through established departments and schools of the university system. All senior colleges and universities of North Carolina are eligible to participate in the institute's research program.

University Development

John T. Kanipe, Jr., *Vice Chancellor for University Development*

H. Ken DeDominicis, *Associate Vice Chancellor for University Development*

The Office of University Development is the principal private fund-raising division of the university. It embraces the work of the Board of Trustees of the Endowment Fund, the NCSU Alumni Association, and thirteen University affiliated private support organizations.

The Board of Trustees of the Endowment Fund of North Carolina State University

The Board of Trustees of the Endowment Fund was established under the Legislative Act creating The University of North Carolina System October 30, 1971. The Board is charged with administering bequests, donations and gifts to the University.

N.C. Agricultural Foundation, Inc.

The North Carolina Agricultural Foundation, Inc., renders financial assistance in the development of strong teaching, research and extension programs in agriculture through the College of Agriculture and Life Sciences at North Carolina State University.

N.C. Dairy Foundation, Inc.

The North Carolina Dairy Foundation, Inc., promotes and improves all phases of dairying in North Carolina through education, research and extension. A 48-member board of directors handles the affairs of the foundation. These directors represent distributors, producers, and jobbers.

N.C. Engineering Foundation, Inc.

The North Carolina Engineering Foundation, Inc., gives financial assistance to the programs in the College of Engineering.

N.C. Forestry Foundation, Inc.

The North Carolina Forestry Foundation, Inc., was incorporated April 15, 1929. The foundation manages the Hofmann Forest (consisting of about 80,000 acres in Jones and Onslow counties), which is used as a demonstration and research laboratory for the College of Forest Resources at North Carolina State University.

N.C. Physical and Mathematical Sciences Foundation, Inc.

The College of Physical and Mathematical Sciences shared private support with the College of Engineering from the North Carolina Engineering Foundation for its first 25 years. On April 11, 1983, the Physical and Mathematical Sciences Foundation, Inc. was organized for the exclusive enhancement of the College of Physical and Mathematical Sciences' teaching, research, and public service programs.

N.C. Textile Foundation, Inc.

The North Carolina Textile Foundation, Inc., was formed to promote the development of the College of Textiles, and was incorporated December 31, 1942. Funds for this foundation have been raised largely from textile fiber and apparel industries, individuals, and other corporations and industries closely allied with these industries.

N.C. Tobacco Foundation, Inc.

This foundation was organized in 1975 to enhance the state's long-established and highly successful tobacco improvement program. The foundation provides the means for agricultural leaders to invest in N.C. State tobacco research and extension activities.

N.C. Veterinary Medical Foundation, Inc.

The North Carolina Veterinary Medical Foundation, Inc., was formed May 18, 1978. Foundation funds are used to support the educational, research, and community service activities of the new College of Veterinary Medicine at North Carolina State University.

N.C. 4-H Development Fund, Inc.

The North Carolina 4-H Development Fund, Inc., was organized in 1959. Four-H Development Fund monies are used to promote and advance all areas of 4-H Club work in North Carolina.

North Carolina State Alumni Association

The NCSU Alumni Association is committed to maintaining contact between the University and its alumni, and to raising funds for the University's advancement through individual alumni contributions.

North Carolina State University Education Foundation, Inc.

The North Carolina State University Education Foundation, Inc., was chartered on October 20, 1972. The foundation's principal purpose is to support through private funds the teaching, research, and extension programs of the College of Education and Psychology at North Carolina State University.

North Carolina State University Foundation, Inc.

The North Carolina State University Foundation, Inc., was organized December 11, 1942, to foster and promote the general welfare of North Carolina State University and to receive and administer gifts and donations for such purposes.

North Carolina State University Humanities Foundation, Inc.

The North Carolina State University Humanities Foundation, Inc., was officially incorporated on May 15, 1974. The foundation's objectives are to aid and promote, by financial assistance and otherwise, all types of education and research in the College of Humanities and Social Sciences at North Carolina State University.

North Carolina State University Parents' Association

This support organization provides a forum for the expression of ideas and concerns from the parents to the administration of the University.

North Carolina State University School of Design Foundation, Inc.

The North Carolina State University School of Design Foundation, Inc., was organized in January 1949. Foundation funds are used for the promotion and advancement of the School of Design at North Carolina State University.

The Pulp and Paper Foundation, Inc.

The Pulp and Paper Foundation, Inc., was incorporated December 19, 1954, by the leadership of the Southern pulp and paper mills to support the program of pulp and paper technology in the College of Forest Resources.

University Relations

Albert B. Lanier, Jr., *Vice Chancellor University Relations*

The Office of University Relations plans and directs NCSU's public relations and institutional communications program with the goal of building public understanding and support of the University. It coordinates and supports the marketing and communications activities of the colleges, schools, and administrative divisions. University Relations incorporates the Office of Information Services and Broadcast Services, and the Public Relations Advisory Committee.

OFFICE OF INFORMATION SERVICES

Lucy Coulbourn, *Director*

The Office of Information Services oversees the areas of media relations, public information and University publications. In its role as a news service it provides news and feature materials to media about the academic programs, research and extension activities and the activities of students and faculty. Information Services is charged with the responsibility for communicating to the public through the media of the state and the nation, the many dimensions of the University and its contribution to the general public welfare. Among its many publications are *Statelog*, sent to some 70,000 alumni and other University supporters, and *The Journal*, a publication for faculty and staff.

The office is located temporarily at 219 Oberlin Road.

OFFICE OF BROADCAST SERVICES

Robert S. Cairns, *Director*

The Office of Broadcast Services produces broadcast radio and television materials for distribution to regional and national stations and networks. Broadcast Services works closely with the Office of Information Services and the coordinator of Electronic Media. The office develops and produces video news releases, television public service announcements and the University video magazine as well as special projects highlighting academic and research accomplishments throughout the University.

The office is located in Tompkins Hall.

The University Closed Circuit Program, a maintenance and repair facility for campus television equipment, is housed in D. H. Hill Library and is a part of the Office of Broadcast Services.

PUBLIC RELATIONS COMMITTEE

An advisory committee of lay leaders, a number representing various media, the Public Relations Committee assists the University administration and the Development Board in assessing and conducting public relations.

The Alumni Association

Bryce R. Younts, *Director of Alumni Relations*

The NCSU Alumni Association, a non-profit organization administered by the staff of the Office of Alumni Relations, functions to maintain ties between North Carolina State University and its alumni and to promote the progress of the University.

The office's duties to alumni are to maintain alumni records; communicate with alumni through various publications; organize alumni activities such as reunions, tours, area meetings and special events; and inform alumni of educational opportunities and other services available to them from their alma mater.

For the University, the Office of Alumni Relations administers programs of University support and, in conjunction with the Alumni Association, conducts the annual Alumni Loyalty Fund campaign.

To the students of NCSU, the work of Alumni Relations and the Alumni Association means merit and need-based scholarships, including the prestigious John T. Caldwell Alumni Scholars Program, student loans, assistance for academically related student activities, sponsorship of the N.C. State Student Alumni Associates and special services to freshmen and graduating seniors.

For the faculty of NCSU, private support efforts provide professorships as well as teaching, extension and research awards.

Library support and a University Advancement Fund are also part of the NCSU support program made possible by the Alumni Association and administered through the Office of Alumni Relations.

The main vehicle of communication between North Carolina State University and its alumni is the *North Carolina State Alumni Magazine*, published five times a year by the Alumni Association. In addition to providing the traditional news of alumni and campus events, the magazine's aim is to entertain and inform readers by covering the views, challenges and achievements of NCSU people and by examining issues that relate to public affairs and higher education.

Membership in the NCSU Alumni Association is open to all former students, regardless of their length of stay at N.C. State. Associate membership is available to all friends of the University.

Students and parents are invited to visit the Office of Alumni Relations, located in the Alumni Memorial Building on Pullen Road. To inquire about programs of service, call 1-919-737-3375 or 1-800-NCS-ALUM; or write the NCSU Office of Alumni Relations, Box 7503, North Carolina State University, Raleigh, NC 27695-7503.

North Carolina State University

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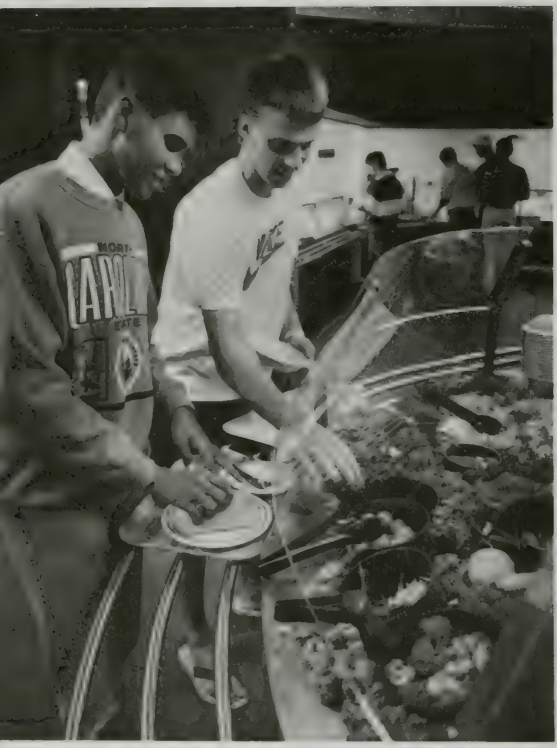

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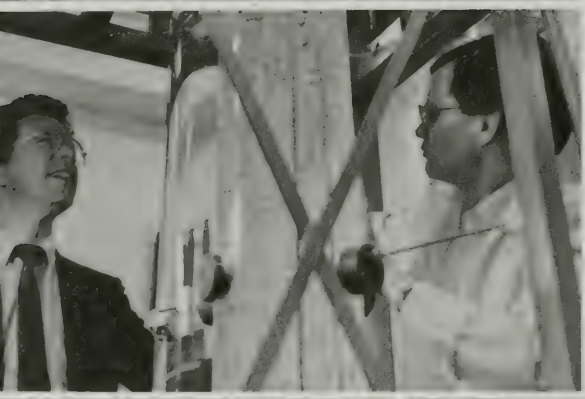

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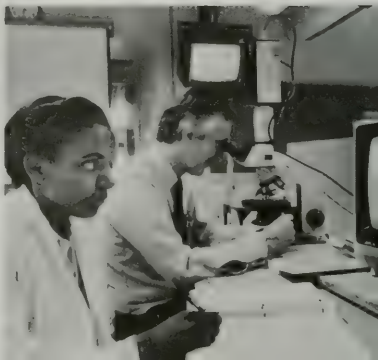

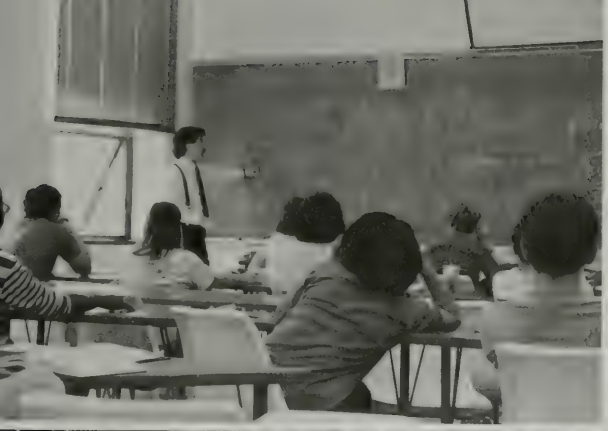

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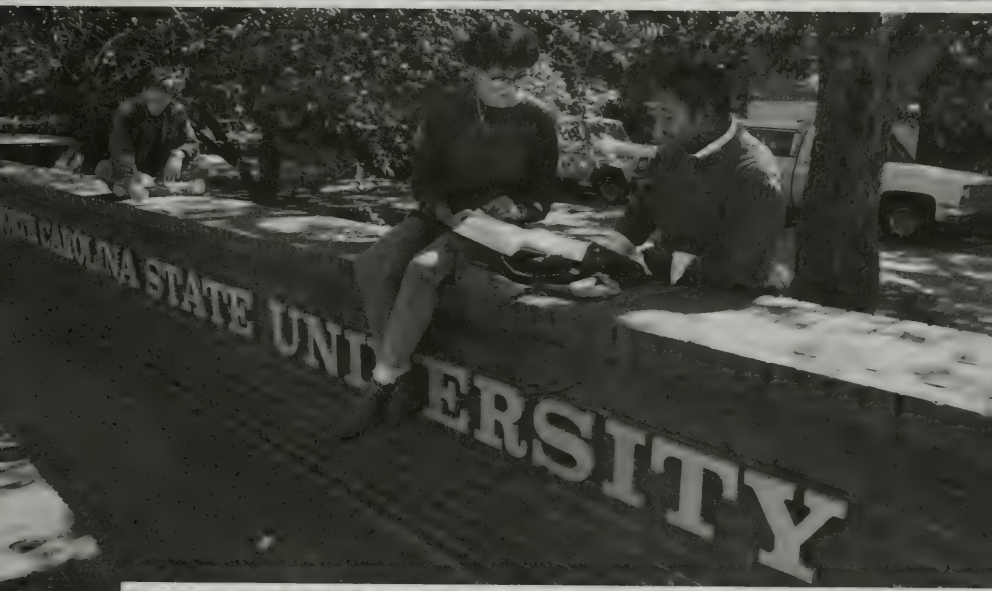
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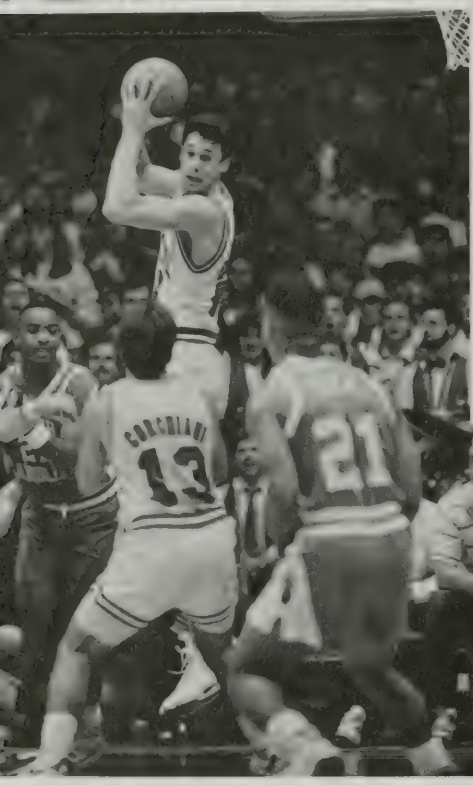
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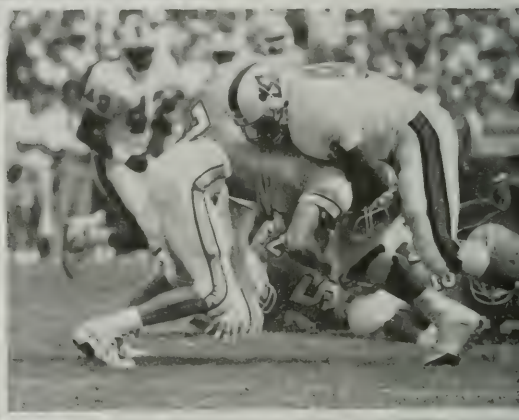

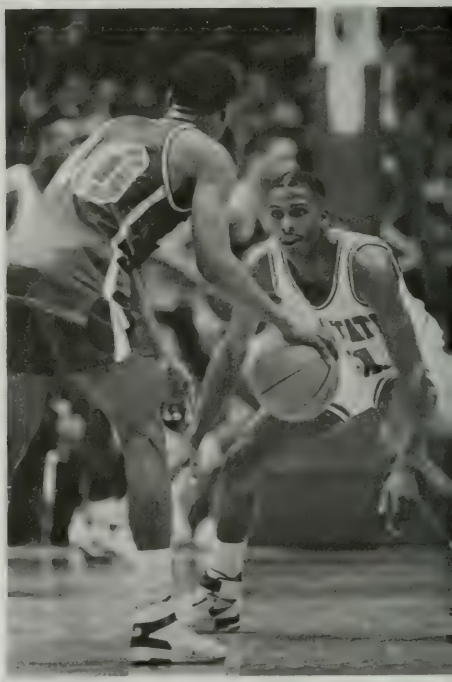

COURSE DESCRIPTIONS

The course descriptions are arranged first in alphabetical order according to **course prefix** reflecting the department or discipline of the course. Some courses are cross-listed, indicating that they are offered in two or more departments or disciplines. Within each of the prefix groups, the course descriptions are arranged by **course number:** numbers 100-299 are courses intended primarily for freshmen and sophomores; numbers 300-499 are courses intended primarily for juniors and seniors; numbers 490-498 are seminar, project, or special topics courses; number 499 is for undergraduate research.

This section contains all undergraduate courses, 100-level through 400-level, approved for the 1991 Spring Semester. It also contains selected 500-level graduate courses which are available to advanced undergraduates who have the required prerequisites. It does not contain any 600-level courses which are available to graduate students only. For a complete listing of 500- and 600-level courses, see the Graduate Catalog.

A typical course description shows the prefix, number, and title followed by prerequisite, credit, and offering information. **Prerequisites** are courses or levels of achievement that a student is expected to have completed successfully prior to enrolling in a course. **Corequisites** are courses which should be taken concurrently by students who have not previously completed the corequisites. Prerequisites and corequisites for a given course may be waived by the instructor of the course or section. It is the student's responsibility to satisfy prerequisites, or obtain from the instructor written waiver of prerequisites, for any course in which he or she may enroll. Failure to satisfy prerequisites may result in removal from enrollment in the course. Consent of the department is required for all practicum and individual special topics or special problems courses as well as internships and thesis or dissertation research. Some courses also have **restrictive statements**, such as "Credit in both MA 141 and MA 131 is not allowed." Restrictive statements for a given course may be waived only by a college dean.

An example of **credit** information is: 4(3-2) F, S, Sum. The 4 indicates the number of semester hours credit awarded for satisfactory completion of the course. The (3-2) normally indicates that the course meets for three hours of lecture or seminar each week and for two hours of laboratory, problem, or studio work each week. Some courses are offered for variable credit, and a listing of 1-6 indicates that from one to six semester hours of credit may be earned as arranged by the department offering the course.

Offering information is shown as F, S, Sum, Alt. yrs. F indicates that the course is normally offered in the Fall Semester, S indicates the Spring Semester, and Sum. indicates the Summer Sessions. Alt. yrs. indicates the course is normally offered in alternate years. The absence of offering information indicates that there is no fixed pattern, and students should check with the department concerning when a particular course will be offered.

Other abbreviations used in the course descriptions are: CI, consent of instructor required; grad., graduate; undergrad., undergraduate; sr., senior; jr., junior; soph., sophomore; fr., freshman; lab., laboratory; lect., lecture; and sem., seminar.

CONTENTS

AC	Agricultural Communications	BS	Biological Sciences
ACC	Accounting	CE	Civil Engineering
ALS	Agriculture and Life Sciences	CFR	Forest Resources
		CH	Chemistry
ANS	Animal Science	CHE	Chemical Engineering
ANT	Anthropology	CL	Comparative Literature
ARC	Architecture	COM	Communication
AS	Aerospace Studies	CS	Crop Science
BAE	Biological and Agricultural Engineering	CSC	Computer Science
		DF	Design Fundamentals
BCH	Biochemistry	DN	Design
BMA	Biomathematics	E	Engineering
BO	Botany	EAC	Adult and Community College Education

EB	Agricultural and Resource Economics; Business Management; Economics
ECD	Counselor Education
ECE	Electrical and Computer Engineering
ECI	Curriculum and Instruction
ED	Education
ELP	Educational Leadership and Program Evaluation
EMS	Mathematics/Science Education
ENG	English
ENT	Entomology
EOE	Occupational Education
FL	Foreign Languages and Literatures
FLC	Chinese Language and Literature
FLE	English for Foreign Students
FLF	French Language and Literature
FLG	German Language and Literature
FLH	Hebrew Language and Literature
FLI	Italian Language and Literature
FLJ	Japanese Language and Literature
FLK	Swahili (Kiswahili) Language and Literature
FLP	Portuguese Language and Literature
FLR	Russian Language and Literature
FLS	Spanish Language and Literature
FOR	Forestry
FS	Food Science
FW	Fisheries and Wildlife Sciences
GC	Graphic Communications
GN	Genetics
GRK	Greek Language and Literature
HA	History of Art
HI	History
HS	Horticultural Science
HSS	Humanities and Social Sciences
IA	Industrial Arts
IE	Industrial Engineering
LAR	Landscape Architecture
LAT	Latin Language and Literature
MA	Mathematics
MAE	Mechanical and Aerospace Engineering
MAT	Materials Science and Engineering
MB	Microbiology
MDS	Multidisciplinary Studies
MEA	Marine, Earth, and Atmospheric Sciences
MS	Military Science
MUS	Music
NE	Nuclear Engineering
NS	Naval Science
NTR	Nutrition
OR	Operations Research
PA	Public Administration
PD	Product Design
PE	Physical Education
PHI	Philosophy
PHY	Physiology
PM	Pest Management
PMS	Physical and Mathematical Sciences
PO	Poultry Science
PP	Plant Pathology
PS	Political Science
PSY	Psychology
PY	Physics
REL	Religion
RRA	Recreation Resources Administration
SOC	Sociology
SP	Speech-Communication
SSC	Soil Science
ST	Statistics
SW	Social Work
T	Textiles
TAM	Textile and Apparel Management
TC	Textile Chemistry
TE	Textile Engineering
TED	Technology Education
TOX	Toxicology
TS	Textile Science
TT	Textile Technology
UNI	University Studies
VD	Visual Design
VMA	Anatomy, Physiological Sciences & Radiology
VMC	Companion Animal and Special Species Medicine
VMF	Food Animal and Equine Medicine
VMM	Microbiology, Pathology, and Parasitology
VMS	Veterinary Medical Sciences
WPS	Wood and Paper Science
ZO	Zoology

AGRICULTURAL COMMUNICATIONS

AC 311 Communication Methods and Media. *Preq: ENG 112. 3(3-0) F.* Foundational frameworks of agricultural communications. The technologies of communication and the systematic approach to the development of communication materials. Development of applied skills in the areas of design, production, evaluation, and dissemination of information unique to the agriculturist. BOSTICK

AC 470 Agricultural Communications. *Preq: AC 311. Senior Standing. 3(3-0) S.* Theory, research and structure of informational techniques and delivery systems designed for Agricultural Communications producers and consumers. A study of the traditional to current needs and ramifications. BOSTICK

AC (FW) 485 Natural Resources Advocacy. *Preq: ENG 321. (3(2-3) S.* Analysis of natural resources problems as they affect management agencies and user groups. Development of professional attitudes, policies, and skills needed for the management of sensitive natural resource issues through application of techniques in the field. Student presentations, demonstrations and development of natural resource planning models that integrate biological skills with management alternatives and are critiqued by resource field staff.

Selected 500-level Courses Open to Advanced Undergraduates

AC 590 Special Topics in Agricultural Communications. *Preq: Sr. or grad. standing. 1-6.*

ACCOUNTING

(Also see EB-Economics and Business)

ACC 210 Accounting I—Concepts of Financial Reporting. *Credit may not be received for both ACC 210 and 280 or 260. 3(3-0) F,S,Sum.* Financial reporting concepts, the information generating process, income measurement, resource valuation, corporate equity measurement, reporting practices, and the interpretation and analysis of financial statements. Basic accounting principles and concepts, the accounting cycle, purchase and sale transactions, internal controls dealing with cash, receivables and payables, inventories, and plant and equipment considerations.

ACC 220 Accounting II—An Introduction to Managerial Accounting. *Preq: ACC 210. Credit may not be received for both ACC 220 and 280 or 261. 3(3-0) F,S,Sum.* Analysis of accounting data that are useful in managerial decision making and in the control and evaluation of the decisions made within business organizations. An introduction to basic models, financial statement analysis, cost behavior analysis and cost control procedures.

ACC 280 Managerial Accounting. *Credit may not be received for both ACC 280 and ACC 210, or 220. 3(3-0) F,S.* Principles underlying financial reporting. Analysis of cost and other quantitative data for managerial decision making. Focus on uses of accounting information. FERRARO

ACC 310 Intermediate Financial Accounting I. *Preq: ACC 210 with grade of C or better; ACC 200; Coreq: ACC 220. Credit may not be received for both ACC 310 and 360. 3(3-0) F,S,Sum.* Conceptual framework of financial accounting and application of professional standards. Measurement and reporting issues related to cash, accounts receivable inventories, operating assets, and intangible's.
BARTLEY, GRIFFIN, MARSH, THORNE

ACC 311 Intermediate Financial Accounting II. *Preq: ACC 310 with a grade of C or better. Credit may not be received for both ACC 311 and 361. 3(3-0) F,S,Sum.* Theory and professional standards for analyzing and reporting enterprise liabilities and equities. Valuation of liabilities, contingencies, stock transactions, and dividends. Measurement and reporting issues related to dilutive securities, leases, and pensions.
COX, GRIFFIN, ROCKNESS

ACC 312 Intermediate Financial Accounting III. *Preq: ACC 311 with a grade of C or better. Credit may not be received for both ACC 312, ACC 410 or 401. 3(3-0) F,S,Sum.* Complex income measurement and disclosure issues. Valuation and reporting problems pertaining to intercorporate investments, specialized revenue recognition, income tax allocation, accounting changes and cash flow analysis. Fund accounting for governmental units and nonprofit organizations. BARTLEY, COX, FRAZIER

ACC 320 Managerial Uses of Cost Data. *Preq: ACC 220. Credit may not be received for both ACC 320 and 262. 3(3-0) F,S,Sum.* Managerial uses of cost data in planning, controlling, and evaluating organizational activities and in making business decisions. Budgeting, cost behavior, product costing and pricing, and an introduction to production cost. CHEN, RODGERS, WILLIAMS, ZUCKERMAN

ACC 330 An Introduction To Income Taxation. *Preqs: ACC 210 and EB 201. Credit may not be received for both ACC 330 and 364. 3(3-0) F,S.* Principles and procedures of individual and business entity income taxation. Basic definitional tax concepts of income, deduction, credit, and gain or loss. Tax research methodology and tax planning techniques. CARRAWAY, MESSERE, PEACE, SAWYERS

ACC 420 Production Cost Analysis and Control. *Preq: ACC 320 and EB 350. Credit may not be received for both ACC 420 and 362. 3(3-0) F,S.* Managerial reporting practices for producing activities, development and use of cost standards and budgets, and cost measurement of productive inputs for units of productive outputs. Managerial use of cost data in analyzing, planning, and controlling business activity. Consideration of information systems and internal controls. ZUCKERMAN

ACC 430 Advanced Income Tax. *Preqs: ACC 310, 330. Credit may not be received for both ACC 430 and 465. 3(3-0).* Federal income tax treatment of corporations; partnerships; estates; trusts; and profit and loss distributions to shareholders, partners, and beneficiaries. Introduction to wealth transfer taxes and family planning. MESSERE, PEACE

ACC 440 Accounting Information Systems. *Preqs: ACC 200, ACC 310, ACC 320, CSC 200. Credit cannot be received for both ACC 340 and 440. 3(2-2) F,S.* Systems concepts, including the theory, principles, and controls inherent in accounting systems analysis, design, and development. Subsystems of the total accounting system including sales/receivable, purchases/payable, cash receipts, cash disbursements, payroll, inventory, and production subsystems. Uses microcomputers. GRIFFIN

ACC 450 Auditing Financial Information. *Preq: ACC 311, EB (ST) 350. Credit may not be received for both ACC 450 and 466. 3(3-0) S.* Objectives, procedures, practices and theory of the examination of financial information; the professional standards and ethical codes of the public accounting profession; features of internal control and EDP systems and other professional topics including overview of internal and operational auditing and SEC requirements; extensive use of professional literature and authoritative pronouncements. BUCKLESS, SKENDER

ACC 460 Advanced Financial Reporting. *Preq: ACC 311. 3(3-0) F,S,Sum.* Accounting for corporate mergers and acquisitions, consolidated financial statements, partnerships, business reorganizations and liquidations. Multinational accounting, segment and interim reporting, and SEC disclosure requirements. ROCKNESS, SKENDER, THORNE

ACC 470 Accounting Theory. *Preqs: ACC 312, EB 301, EB (ST) 350. Credit may not be received for both ACC 470 and 489. 3(3-0) S.* Major concepts, problem areas and trends in accounting thought and practice, including a review of the most prominent controversies in current publications and the most recent relevant pronouncements of professional institutions. FRAZIER, WILLIAMS

ACC 480 Accelerated Survey of Financial and Management Accounting. *Credit may not be received for both ACC 480 and ACC 220, 280 or 469. Intended for graduate students and advanced undergraduates not in Economics and Business. 3(3-0) F.* Accelerated survey of basic concepts underlying accounting in profit-oriented firms: data measurement, summarization and reporting practices as a background for use of accounting

information; content of published financial statements; and uses of accounting for management decisions in product costing, budgeting, and operations.
FRAZIER, ROCKNESS

ACC 490 Senior Seminar in Accounting. *Enrollment in this course is restricted to accounting majors in their final semester of study. PBS students admitted by permission of department head. 3(3-0) S.* Integration of financial, managerial, tax, and governmental accounting. Application of appropriate accounting methods to problem resolution.
ROCKNESS, SKENDER

ACC 495 Special Topics in Accounting. *Preq: Consent of Instructor. 1-6.* Presentation of material not normally available in regular course offerings, or offering of new courses on a trial basis.

ACC 498 Independent Study in Accounting. *1-6. F,S,Sum.* Detailed investigation of topics of particular interest to advanced undergraduates under faculty direction on a tutorial basis. Credits and content determined by faculty member in consultation with Associate Department Head.

Selected 500-Level Course Open to Advanced Undergraduates

ACC 520 Advanced Management Accounting. *Preqs: ACC 480, EB (ST) 350 and EB 501. 3(3-0) S.*

AGRICULTURE AND LIFE SCIENCES

ALS 103 Introductory Topics in the Agricultural and Life Sciences. *1(1-0) F,S. Not open to seniors.* Introduction to scope and objectives of University education. Emphasis on sciences, particularly as related to biology and agriculture. Guest lectures, departmental programs and career opportunities. GRANT, ORT

ALS 110 Agriculture and Life Sciences Scholars Forum. *Preq: Enrollment limited to participants in the Agriculture and Life Sciences Scholars Program. 0(2-0) F.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

ALS 299 Agriculture and Life Sciences Honors Seminar. *Enrollment by invitation for sophomores or juniors in CALS with GPA 3.25 or higher. 2(2-0) S.* A seminar/discussion honors course with emphasis on the scientific method; exposure to library, laboratory and field research strategies and teaching techniques; acquaintance with training and career opportunities in the agricultural and life sciences; participation in two-day, off-campus CALS Honors Retreat.

ALS (HSS) 490 International Seminar. *Preq: Junior standing. 1(1-0) S.* Cultural, economic and social aspects of developing countries, focusing on factors involved in change and the process of development. FAHMY

ALS 498 Honors Research or Teaching I. *Preqs: ALS 299 & GPA 3.25 or higher. 1-3 F,S, Sum. A maximum of 6 credits for ALS 498 & ALS 499 combined.* Honors research or teaching for students in Agriculture and Life Sciences. First of a two-course sequence. Identification of a project and development of a proposal; literature search, planning, and work initiation.

ALS 499 Honors Research or Teaching II. *Preq: ALS 498 & GPA 3.25 or higher. 2-4 F,S,Sum. A maximum of 6 credits for ALS 498 and ALS 499 combined.* Honors research or teaching for students in Agriculture and Life Sciences. Completion of work initiated in ALS 498. Analysis of results. Preparation and presentation of written and oral reports.

ANIMAL SCIENCE

ANS 100 Perspectives in Animal Science. *1(1-0) F.* Discussion of current status of animal agriculture, extension and research. Career opportunities and qualifications for employment in animal agriculture and related fields. McDOWELL

ANS 200 Introduction to Animal Science. *4(3-2) F,S.* The fundamental principles of animal production. The importance of livestock and livestock products in the human diet and in the economy. ESBENSHADE, RAKES

ANS 201 Techniques of Animal Care. *Preq: ANS 200. 2(0-4) S.* A laboratory course in the applied management of beef cattle, dairy cattle, swine and sheep with participatory assignments of common techniques utilized in animal production. DAVENPORT, RAKES

ANS 202 Techniques of Horse Care. *Preq: ANS 200. 2(0-4) F.* A laboratory course providing students opportunities to learn applied management skills required in horse production. Participatory assignments of common techniques utilized in horse production will be emphasized. BARNETT

ANS (PO) 204 Feeds and Feeding. *Preq: Sophomore standing. 4(3-3) S.* Applied nutrition of livestock and poultry. Digestion and function of nutrients. Classification, processing and use of feedstuffs. Formulation of rations to meet nutritional requirements. Demonstrations of nutritional deficiencies. RAMSEY

ANS 210 Microcomputers in Animal Production. *Preq: ANS 200. 2(1-2) F,S.* Use of microcomputers to better understand animal production and management concepts. Word processing, spreadsheets, data base management and specialized accounting and planning programs. ARMSTRONG, CARUOLO, WILK

ANS 300 Animal Production Field Study Trip. *Preq: ANS 200. 1(0-2) F,S.* Animal agriculture and related agribusiness in North Carolina. Three-day field trip with fee required.

ANS (FS, NTR) 301 Modern Nutrition. *Preq: Sophomore standing. Food science majors may use as a free elective only. 3(3-0) F,S.* (See NTR—Nutrition.) ASH

ANS 302 Livestock and Dairy Evaluation. *3(2-3) S.* Market classes and grades of beef cattle, swine, and sheep are used to study live animal—carcass value interrelationships. Breed histories, pedigrees and desirable characteristics of meat and dairy animals are discussed.

ANS 303 Principles of Equine Evaluation. *2(1-3) S.* Conformation as it relates to the function, performance and soundness of the horse. Breed standards, rules and regulations pertaining to evaluation, selection and performance. One or two overnight field trips are required. BARNETT

ANS 308 Advanced Livestock Judging. *Preq: ANS 302 or ANS 303. May be repeated three times with one credit for each category of livestock covered.* Intensive practice in judging market and purebred meat animals, dairy cattle, or horses. Extensive field trips. Some student expense.

ANS 310 Basic Horse Husbandry. *Cannot substitute for ANS 410 in fulfilling departmental requirements. 3(2-2) F.* Basic principles of horse husbandry; origin, breeds and functions of horses; basics of feeding, breeding, behavior, disease prevention and management. Field trips. CORNWELL

ANS 311 Livestock Breeding and Improvement. *Preqs: BS 100, ANS 200. 3(3-0) F.* Principles of genetics applied to the improvement of domestic livestock. Principles of inheritance, phenotypic variation, selection response, breeding value estimation, heterosis, crossbreeding systems and genetic decisions in livestock production systems. McDANIEL

ANS (FS, PO) 322 Muscle Foods and Eggs. *Preq: BS 100. 3(2-3) F.* Processing and preserving fresh poultry, red meats, seafoods, and eggs. Ante- and post-mortem events as they affect quality, yield and compositional characteristics of muscle tissues. BALL

ANS (FS) 324 Milk and Dairy Products. *Preq: BS 100. 2(2-0) F.* Composition of milk and dairy products, federal standards, raw milk procurement, cleaning and sanitizing and quality attributes. HANSEN

ANS 330 Reproductive Physiology. *Preq: Junior Standing. 3(2-3) F.* Current concepts of reproductive physiology with emphasis on reproduction in farm animals. Anatomical and endocrine relationships as influenced by environmental and genetic factors. Management procedures for maximizing reproductive performance. BRITT

ANS 402 Beef Cattle Management. *Preq: ANS 204. 3(2-3) S.* Principles and practices of production, management and marketing of beef cattle. Modern management practices netics, emphasizing the application of principles of genutrition, reproduction and animal health. HARVEY

ANS 403 Swine Management. *Preq: ANS 204. 3(2-3) F.* The economic, nutritional, genetic, physiological and managerial factors affecting the operation of modern swine enterprises. Practices for the commercial producer emphasized. Laboratory trips required. ESBENSHADE

ANS 404 Dairy Cattle Management. *Preq: ANS 204. 3(2-3) S.* The management of economic, nutritional, genetic, and physiological factors that influence the operation of a dairy enterprise. WILK

ANS 405 Lactation. *Preq: BS 100. 3(2-3) S.* Gross and microscopic anatomy of the developing and the mature mammary gland. Physiological processes involved in milk secretion and the removal of milk from the gland. Research problem required.

ANS 406 Sheep Management. *Preq: ANS 204. 3(2-3) S. Alt. yrs.* The economic, genetic, nutritional, physiological and managerial factors affecting the operation of the modern sheep enterprise. POND

ANS 410 Equine Management. *Preq: ANS 204 or ANS 310. 3(2-2) S.* Equine anatomy, physiology, nutrition, genetics and health. Laboratory emphasis on reproductive management, breeding, problem solving, and management skills. Field trips required. CORNWELL

ANS 412 Applied Animal Breeding. *Preq: ANS 311. Students may elect to take 1, 2, 3, or 4 of ANS 412 A, B, C, or D. 1-4 S.* Breeding methods for improvement of specific classes of livestock presented as a series of mini-courses. ANS 412A, Applied Beef Cattle Breeding; ANS 412B, Applied Dairy Cattle Breeding; ANS 412C, Applied Swine Breeding; ANS 412D, Genetics and Breeding—Selected Topics.

ANS (NTR, PO) 415 Comparative Nutrition. *Preqs: CH 220 or both 221 and 223. 3(3-0) F.* Principles of nutrition, including the classification of nutrients and the nutrient requirements of and species for health, growth, maintenance and productive functions. DONALDSON

ANS (NTR) 419 Human Nutrition in Health and Disease. *Preqs: BCH 451, NTR 415 or FS 400. 3(3-0) S.* (See NTR—Nutrition.) ASH

ANS 490 Seminar in Animal Science. *Preq: Junior standing. 1(1-0) F.* Collection, evaluation, organization and oral presentation of information in animal science; resume writing; interview skills. DAVENPORT

ANS 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

ANS 493 Special Problems in Animal Science. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resource. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

ANS 495 Special Topics in Animal Science. *1-3 F,S,Sum.* Offered as needed to present material not normally available in regular course offerings or for offering of new courses on a trial basis.

Selected 500-Level Courses Open To Advanced Undergraduates

ANS 500 Advanced Ruminant Nutrition. *Preq: ANS 204 or ANS 415. 3(3-0) Alt. Sum.*

ANS (PHY) 502 Reproductive Physiology of Vertebrates. *Preq: ZO 421. 3(3-0) S.*

ANS (GN) 508 Genetics of Animal Improvement. *Preqs: GN 411, ST 511. 3(3-0) S.*

ANS 510 Advanced Livestock Management. *Preq: ANS 402 or ANS 403 or ANS 404. 3(3-0) S.*

ANS (NTR) 516 Quantitative Nutrition. *Preq: BCH 451 or NTR (ANS) 415 or NTR (ANS) 419 or FS 400. 3(1-6) S.*

ANS 520 Tropical Livestock Production. *Preq: Six hours of ANS at 400-level. 3(3-0) F.*

ANS (NTR) 540 Ruminant Physiology and Metabolism. *Preqs: BCH 451 or 551, ZO 421. 3(3-0) F. Alt. yrs.*

ANS (PHY) 580 Mammalian Endocrine Physiology. *Preqs: BCH 451, ZO 421. 3(3-0) F.*

ANS 590 Topical Problems in Animal Science. *Maximum 6 F,S.*

ANTHROPOLOGY

(Also see SOC—Sociology; SW—Social Work.)

ANT 251 Physical Anthropology. *3(3-0) F,S,Sum.* Introduction to the study of human evolution. Topics include the processes of evolution, human variation and race, behavior and morphology of nonhuman primates, and the fossil record. Emphasis is placed on the study of human biosocial adaptation, past and present, and on humans as culture-bearing primates.

ANT 252 Cultural Anthropology. *3(3-0) F,S,Sum.* Comparative study of contemporary human culture, social institutions and processes that influence behavior. The range of human cultural variation shown throughout the world, including the student's own culture system.

ANT 253 Introduction to Prehistory. *3(3-0) F,S,Sum.* World-wide survey of origins of human society, technology and culture in Old Stone Age, and origins of agriculture, cities, and civilizations of the Bronze and Iron Age in Europe, Asia, Africa, and pre-Columbian Middle and South America.

ANT 254 Language and Culture. *3(3-0) F,S.* Focuses on the relationship among aspects of human language and between aspects of language and culture. Surveys such topics as: descriptive and comparative linguistics, structuralism, language and thought, sociolinguistics, bilingualism, culture change and linguistic change.

ANT (SOC) 261 Technology in Society and Culture. *3(3-0) F,S.* Processes of social and cultural change with focus on role of technological innovation. Cross-cultural emphasis. Special attention to role of scientists and engineers in socio-cultural change. Social and cultural impact analysis of planned technological change. Topical case studies apply course concepts and principles. Includes core sociological concepts, methods, theories.

ANT 310 Indians of North America. *Preq: ANT 252 or ANT 311 or HI 365. 3(3-0).* Indian peoples and cultures north of the Rio Grande. Theories of origin; selected prehistoric cultural manifestations; people and cultures at the time of European contact; concomitants and ramifications of post-contact cultural change; and contemporary Indian problems and prospects. Eskimos and Aleuts included.

ANT 311 Archaeology of North America. *Preqs: Three hours introductory anthropology or sophomore standing. 3(3-0).* Reviews archaeological investigations in North America, beginning with the first Stone Age immigrants to cross the Bering Land Bridge and their expansion over the rest of the North American continent. The diversity of early Eskimo and Indian cultures, social and technological developments, and environmental adaptations during the 10,000 years prior to European arrival will be studied.

ANT 325 Andean South America. *Preqs: 3 hours ANT, or HI 215 or HI 216. 3(3-0).* The societies, cultures, politics, economics and ecology of the Andean countries of South America (Peru, Bolivia, Ecuador, Chile, Columbia). Special attention to agrarian systems.

ANT 330 Peoples and Cultures of Africa. *Preqs: Three hours cultural anthropology or HI 275 or HI 276. 3(3-0) S.* African peoples and cultures, especially in sub-Saharan Africa; past and present social patterns of indigenous African populations from a cross-cultural perspective.

ANT 373 The Human Fossil Record. *Preq: Three hours physical anthropology or archaeology. 3(3-0).* Analysis of the human fossil record and consideration of alternate theories of human evolution.

ANT (COM, HSS, SP) 392 International and Crosscultural Communications. *3(3-0) S.* Patterns and problems of verbal and non-verbal forms of crosscultural communication. Avoidance and management of cultural conflict arising from awareness of characteristics of cross cultural communication. Impact on communication of differing cultural perspectives.

ANT 416 Research Methods in Cultural Anthropology. *Preq: Six hours ANT. 3(3-0).* A systematic overview of cultural anthropological research methods including designing research projects, research techniques, field work methods, and cross-cultural comparison. Reviews relevant ethical questions and anthropologists' reports of their own field work.

ANT 420 Biological Bases for Human Social Behavior. *Preq: ANT 251 or 3 hours biological sciences. 3(3-0).* Relevance and applicability of animal behavior to the study of human social behavior. Nature and uniqueness of human behavior in light of social behavior of animals, particularly the nonhuman primates.

ANT 460 Urban Anthropology. *Preq: ANT 252. 3(3-0).* Anthropological study of cities. Examination of cross-cultural patterns of behavior in urban areas and adaptive strategies that urban dwellers employ. Introduction to major theoretical and methodological approaches relevant to an understanding of contemporary urbanization.

ANT 498 Special Topics in Anthropology. *Preq: Six hours of SOC/ANT 1-6 F,S,Sum.* Detailed investigation of a special topic in anthropology. Topic and mode of study determined by faculty members and students. Also offered as needed for new courses.

Selected 500-Level Courses Open To Advanced Undergraduates

ANT 508 Culture and Personality. *Preq: ANT 501 or 6 hours in cultural anthropology. 3(3-0).*

ANT 511 Anthropological Theory. *Preqs: ANT 501 or 6 hours in cultural anthropology. 3(3-0).*

ANT 512 Applied Anthropology. *Preq: ANT 252 or CI. 3(3-0).*

ARCHITECTURE

(Also see DN—Design.)

ARC 202 Architectural Design: Environment. *Preqs: DF 102, ARC 211, ARC 252, Architecture majors. 6(0-9) S.* Architectural design studio emphasizing the relationship of use, user, environmental context, and climate to building design.

ARC 211 Natural Systems and Site Design. *3(3-0) F,S.* Introduction to thermal, visual, and auditory comfort requirements for people and their implications in energy conscious architectural design. Site planning and design issues and their relationship to architecture case studies of energy conscious design.

ARC 232 Structures and Materials. *3(2-2) S.* Construction materials related to structural applications. Theory of structures and introduction to quantitative analysis. Implications for design. Historical examples and current practices. Laboratory and field trips required.

ARC 244 History of American Architecture. *Does not fulfill humanities elective for School of Design students. 3(3-0) S.* Survey of American architecture from Colonial times to the Second World War.

ARC 252 Computer Methods in Architecture. *Preqs: 6 hours in ARC 400 or ARC 202. 3(2-2) F.S.* An introduction to computers and design methods through applications of architectural graphics, word processing, and spreadsheet software to architectural design decision-making.

ARC 261 Design Methods. *3(3-0) F.* Description, comparison, and testing of methods available in design with emphasis on problem-solving techniques. TECTOR

ARC 263 The Profession of Architecture. *1(1-0) F.* Introduction to architecture as a profession. Historical evolution of the profession, concepts of professionalism and ethics, legal and institutional foundations, and case studies of professional roles in architecture.

ARC 302 Architectural Design: Technology. *Preqs: ARC 202, ARC 232, Architecture majors. 6(0-9) S.* Architectural design studio emphasizing the nature and use of architectural structures, materials, and construction systems in building design.

ARC 331 Architectural Structures I. *Preq: ARC 232 3(2-2) F.* Structural design process. Combined role of imposed loads and architectural function in shaping the form of the building. Interaction of elements in structural systems containing beams, columns, trusses, space frames, slabs, arches, vaults, domes, cables, cable networks, fabrics and diaphrams. Case studies emphasized.

ARC 332 Architectural Structures II. *Preq: ARC 331 3(2-2) S.* Structural systems explored through case studies and design projects. Emphasis on interaction of structural elements. Tracing of loads in structural systems. Sizing of tensile elements, columns, trusses, and flexural elements. Design and sizing of joints.

ARC 369 Practicum in Architecture. *Preqs: One Arch. Studio/Arch. majors only. 2 F.S. Sum. Credit may be use only in BEDA, B.ARCH, M.ARCH.* 400 hours of work experience in an architectural office or equivalent work experience in a related discipline. Student chooses work setting and must make own arrangements. Work activities must be outlined in advance with the employer and with the advice and consent of the Head of the Architecture Department. Student must document work experience.

ARC 400 Architectural Design. *Preq: DF 102. 6(0-9) F.* Studies in architectural design. Projects of many types and scales employed to investigate issues in architecture. Emphasis on independent exploration of design values and their implications.

ARC 402 Architectural Design: History. *Preqs: ARC 302, ARC 400, ARC 441, ARC 494, Architecture majors. 6(0-9) S.* Architectural Design Studio emphasizing the role of precedent in Architecture. Projects utilize comparative studies of concepts and buildings as a basis for design.

ARC 403 Pregraduate Architectural Design (Series). *Track 3 M. ARCH students only. Maximum of 24 credit hours. 6(0-12) F,S.* Studies in architectural design to prepare students with no formal background for entry into the ARC 600 studio sequence. Studio projects deal with typical issues of building design in a range of scales, with an emphasis on processes and skills.

ARC 412 Environmental Control Systems & Site Design. *Preq: ARC 211. 3(3-0)S.* Mechanical and electrical systems for heating, cooling, ventilation, vertical transportation and communication. Water and waste, fire safety, and acoustics. Advanced site planning and design.

ARC 432 Architectural Construction Systems. *Preq: ARC 232 (Previously ARC 254). 3(2-3)F.* Building construction systems related to architectural design. Historical and current building practices. Implications for design and systems selection. Case studies. Field trips are required.

ARC 441 History of Contemporary Architecture. *Preq: Junior standing or DN 141 or DN 142. 3(3-0) F.* A survey and critical examination of modern architecture from its origins in 19th century philosophy and technology to the most recent developments in world architecture. CLARK

ARC 451 Illumination and Design. *Preq: ARC 253. 3(2-2) S.* Principles and design methods for the illumination of buildings and their interior spaces. Students employ model simulation to explore and evaluate alternative lighting designs for various architectural situations.

RIFKI

ARC 452 (DN 452) Environmental Control Systems and Design. *Preq: ARC 253. 3(2-2) S.* Natural and mechanical systems for heating, cooling and ventilating buildings with emphasis on energy conscious design approaches. RIFKI

ARC 494 Internship in Architecture. *Preq: Junior standing in architecture; 3.0 GPA or better; and written approval of department head. 3-6 F,S.* Supervised field experience in architectural offices and organizations. BURNS

ARC 495 Independent Study in Architecture. *Preq: Junior standing in architecture; 3.0 GPA or better; and approval of department head. 1-3 F,S.* Special projects in architecture developed under the direction of a faculty member on a tutorial basis. BURNS

Selected 500-Level Courses Open To Advanced Undergraduates

ARC 501 Professional Architecture Studio I. *Preqs: BEDA degree or equivalent and CI; 6(0-12). F,S.* Design studio investigations aimed at the development of an understanding of the major issues confronting the contemporary architect and at the expanding of problem-solving abilities in architectural design.

ARC 502 Professional Architecture Studio II. *Preqs: ARC 501; ARC 510 and CI. 6(0-12) F,S.* Design investigations aimed at the development of an understanding of the major issues confronting the contemporary architect and at the expanding of problem-solving abilities in architectural design. This is an individualized, final project studio.

ARC 542 Investigations in Recent World Architecture. *Preq: CI. 3(2-1) F.*

ARC 544 Architectural Conservation. *Preq: Advanced undergrad. in DN or grad. standing. 3(3-0) Alt. S.*

ARC 546 Theory of Building Types. *Preq: Two ARC studios. 3(3-0) F.*

ARC 561 The Practice of Architecture. *3(3-0) F.*

ARC 562 Project Processes in Architecture. *Preq: Sr. or grad. standing. 3(3-0) S.*

ARC 570 Theory of Urban Form. *Preq: Advanced undergrad. 3(3-0) Alt. F.*

ARC 571 Urban Housing. *Preq: Advanced undergrad. 3(3-0) S.*

ARC 574 Place and Place Making. *Preq: Advanced undergrad. 3(3-0) F,S.*

ARC 581, 582 Conceptual Issues in Architecture and Design. *Preq: Grad. standing or advanced undergrad. 3(3-0) F,S.*

AEROSPACE STUDIES (AIR FORCE ROTC)

(Also see MS—Military Science; NS—Naval Science.)

GENERAL MILITARY COURSES

AS 121 The Air Force Role in the Department of Defense I. *1(1-1) F.* Initial course in the four year Air Force ROTC curriculum. Familiarizes student with the mission, organization and doctrine of the U.S. Air Force and U.S. strategic offensive and defensive forces. Laboratory corps training provides experience in drill movement, knowledge of customs and courtesies, information about Air Force career opportunities, and the life and work of the junior officer.

AS 122 The Air Force Role in the Department of Defense II. *1(1-1) S.* Continues study of U.S. strategic defensive forces. Familiarizes student with aerospace support forces and U.S. general purpose forces, including those of the Army, Navy and Marines. Corps training stresses fundamentals needed to capably assume and discharge future responsibilities in AFROTC and the U.S. Air Force.

AS 221 The Development of Airpower I. *1(1-1) F.* Airpower from the early years of powered flight through World War II. Factors which have prompted research and technological change. Events which show the impact of airpower on strategic thought. Corps training and laboratory provide experiences designed to develop each student's leadership potential and serve as an orientation to active duty.

AS 222 The Development of Airpower II. *1(1-1) S.* Airpower from the end of World War II to the present. Emphasis on technological change and the events which show the impact of airpower on strategic thought. Corps training and laboratory provide experiences designed to develop each student's leadership potential and serve as an orientation to active duty.

PROFESSIONAL OFFICER COURSES

AS 321 Air Force Management and Leadership. *Preqs: Four year AFROTC Cadet: AS 222. Two-year cadet: Satisfactory completion of six weeks summer camp. 3(3-1) F.* A study of management from the point of view of the Air Force junior officer, including the subjects of military leadership and military law. Attention given to progressive development of communicative skills needed by junior officers. Practical experience in advanced military leadership activities.

AS 322 Air Force Management and Leadership II. *Preq: AS 321. 3(3-1) S.* Class and laboratory study of and practical experience with management functions in the military environment. The planning, organizing, directing, controlling and coordinating functions of management; the command and staff functions in advising, problem solving and decision-making situations. Emphasis on developing communicative skills, leadership abilities and basic knowledge required of an Air Force junior officer.

AS 421 American Defense Policy I. *Preq: AS 322. 3(3-1) F.* The role of national security forces in contemporary American society. The professional military as it relates to the American political and social system. Formulation of military policy is examined in terms of international and domestic constraints. A treatment of the development of modern defense strategy. The student studies and practices communicative skills. Corps training provides for advanced leadership experience.

AS 422 American Defense Policy II. *Preq: AS 421. 3(3-1) S.* Continues the study of national security forces in contemporary American society. Focuses on strategy and management of modern conflict and formulation and implementation of U.S. defense policy. Brief study of the Air Force Officer classification and assignment system. Students develop their communicative skills and participate in advanced leadership situations in corps training.

AS 495 Special Topics in Aerospace Studies. *Preq: CI. 2(2-0) F,S.* Offered as needed to treat new or special subject matter relating to the Department of the Air Force.

AS 499 Flight Instruction Program Ground School. *0(1-0) F.* Develops aeronautical knowledge required by the Federal Aviation Administration for private pilots. It familiarizes students with the appropriate general and visual flight rules of Part 91 of the Federal Aviation Regulations, obtaining and evaluating of flight weather reports and flight planning elements such as plotting courses, estimating time enroute and fuel requirements. Required in the Flight Instruction Program (FIP) for Air Force ROTC cadets.

FIELD TRAINING COURSES

AFROTC field training is offered during the summer months at selected Air Force bases throughout the United States. Students in the four-year program participate in four weeks of field training during the summer after their sophomore year. Students applying for entry into the two-year program must successfully complete six weeks of field training prior to enrollment in AFROTC.

Major study areas in the four-week field training program include junior officer training, aircraft and aircrew indoctrination, career-orientation, survival training, base functions and Air Force environment, and physical training.

The six-week field training program covers all four-week training program areas plus all of the subject matter received by four-year program cadets during their freshman and sophomore years in the General Military Course, including corps training.

BIOLOGICAL AND AGRICULTURAL ENGINEERING

BAE 151 Elements of Biological and Agricultural Engineering I. *Enrollment in SBE/SBA. 2(0-5) F.* Topics basic to Biological and Agricultural Engineering. Basic surveying procedures, tool processes, fabrication procedures and properties of materials. Demonstrations and laboratory practice.

BAE 201 Shop Processes and Management. 3(2-3) F,S. Materials, shop processes, management and safety practices essential to the operation and maintenance of a mechanized farm operation or related agricultural industry. Demonstrations and hands-on practice through laboratory activity. ROBERSON

BAE 211 Farm Machinery. *3(2-3) S.* Operation, maintenance, and adjustment of farm machines. Functional and energy requirements related to economic considerations in ownership and efficient operation. BAUGHMAN

BAE 221 Agricultural Systems I: Microcomputer Applications. *Preq: MA 112 or 114. 3(1-4) F,S. Credit will not be given for both BAE 221 and BAE 241.* Microcomputers and their applications to agricultural systems. Hands-on experience with the following software: word processing, electronic spreadsheet, database management and equation solver. Term project. DONAHUE

BAE 222 Agricultural System II: Methodologies and Approaches. *2(0-4) S.* Systems approaches to complex agricultural situations: entering unstructured situations, expressing a problem situation, formulating root definitions and relevant systems, building conceptual models, comparing models with the real world systems, defining desirable and feasible changes in a system, taking action in problem situations. SOWELL

BAE 241 Computer Applications in Agriculture and Life Sciences. *Preq: MA 112 or MA 114. 3(1-4) F,S.* An introduction to electronic digital computers with emphasis on small low-cost computers and their applications in agriculture and life sciences. DONAHUE

BAE 252 Elements of Biological and Agricultural Engineering II. *Preqs: BAE 151, MA 201. 4(2-4) S.* The traditional subject areas of agricultural engineering will be introduced and the computer will be used to solve typical problems in each of these areas. DONAHUE

BAE 303 Energy Conversion in Biological Systems. *Preqs: BS 100; MA 112 or 102; PY 205 or 211. 2(2-0) S.* Energy transformations and exchanges of plants and animals are studied on the basis of physical theories and principles. Discussion of examples in convection, conduction, radiation, phase change, muscle work, photosynthesis, respiration and concentration of solutions. SUGGS

BAE 311 Agricultural Power and Machinery. *Preqs: CH 101, PY 211 or 221, BAE 211. 3(2-3) S.* Internal combustion engines, gasoline and diesel. Thermodynamic principles and their applications to engine cycles, efficiency, design and operation. Fuel electrical, cooling, lubrication and other engine systems as needed for practical power production. Power trains and hydraulic systems used on farm tractors. BOWERS

BAE (SSC) 323 Water Management. *Preq: Junior standing. 3(2-2) F.* Water management principles applied to agriculture; hydrologic cycle, runoff, surface and subsurface drainage, soil conservation measures to reduce erosion and sedimentation, irrigation, pond construction, open channel flow, water rights, and environmental laws pertaining to water management. Emphasis on problem solving. SNEED

BAE (SSC) 324 Elementary Surveying. *Preq: Junior standing. 1(0-3) F.* Theory and practice of plane surveying to include measuring distances as well as record keeping, differential leveling, profile leveling, topographic mapping, stadia surveying, and the use of these tools in agricultural applications. SNEED

BAE 331 Agricultural Systems III: Management Techniques. *Preqs: BAE 221, EB 212. 2(1-2) F.* Techniques of systems analysis including quantitative economics and project management. Emphasis on applications to agriculture and machinery management. SOWELL

BAE 332 Farm Structures. *Preq: PY 211 or 221. 3(2-3) S.* Environmental relationships, design methods, materials, construction procedures and layout practices as they relate to current changes in agricultural production techniques. Problem situations relating to farm structures are investigated individually by each student in the laboratory. Emphasis on relating the theory to current applications.

BAE 333 Processing Agricultural Products. *Preq: PY 212. 4(3-3).* Application of the principles of fluid flow, heat transfer, refrigeration, psychrometrics, and materials handling to the processing of agricultural products. Pump sizing, heat exchanger selection, refrigeration analyses, fan sizing, crop drying, and selection of materials handling equipment. WILLITS, YOUNG

BAE 342 Agricultural Processing. *Preqs: MA 301, MAE 301, MAE 308. 4(3-2) S.* Theory and application of heat and mass transfer to processing of agricultural crops. Topics include conduction, convection, radiation psychometrics, thin layer drying, deep-bed drying, and continuous-flow drying. Problem sessions will demonstrate principles of air flow, fans, pumps, process control, and various drying systems. YOUNG

BAE 343 Agricultural Electrification. *Coreq: PY 212 or 221. 3(3-0) F.* Practical and efficient use of electrical energy for agricultural and home application. Energy conservation, electric rates, farm and house wiring, circuit design, single-phase and three-phase distribution systems, electric motors, lighting, space and water heating, electric controls, safety and protective devices. BAUGHMAN

BAE 344 Circuits and Controls. *Coreq: PY 212 or 221; BAE 343 or ECE 211. 1(0-3) F.* Applied laboratory covering energy conservation, farm and home wiring, circuit design, single-phase and three-phase distribution systems, electric motors, lighting, heating, electric controls, safety and protective devices, and home water systems. BAUGHMAN

BAE 361 Analytical Methods. *Preqs: BAE 252, MAE 208, MAE 314, MA 301. 3(2-2) S.* Engineering problem solving through studies of topics in mechanical design. Topics include kinematic analysis of linkages, analysis and design/selection of machine structures and power transmission components, including hydraulics. STIKELEATHER

BAE 391 Electrotechnology in Biological and Agricultural Engineering. *Preq: ECE 211. 3(2-3) F.* Fundamental concepts of AC power distribution, grounding, motor selection. Basic principles and characteristics of transducers, amplifiers, power supplies, and read-out devices in measurement systems. Introduction of concepts for designing relay switching. Applications to agricultural problems. McCLURE

BAE 411 Farm Power and Machinery. *Preqs: CH 101; BAE 211; PY 211 or 221. 3(2-3) S.* Internal combustion engines, gasoline and diesel. Thermodynamic principles and their application to engine cycles, efficiency, design and operation. Fuel, electrical, cooling, lubrication and other engine systems needed for practical power production. Power trains and hydraulic systems used on farm tractors. Farm machinery power management principles. BOWERS

BAE 441 Agricultural Systems IV: Modelling and Analysis. *Preqs: BAE 331, ST 361, 3(2-2) F.* Basic concepts and methodology of systems modelling and analysis: linear programming, simulation, and export systems. Applications to agricultural problems. SOWELL

BAE 442 Agricultural Systems V: Senior Project. *Preqs: BAE 222, BAE 441, ENG 321, SP 110. 2(0-4) S.* Individual project using systems approaches to address a complex situation or problem in agriculture.

BAE 451 Agricultural Engineering Design I. *Preq: Senior standing. Completion of junior year BAE requirements in SBE/SBA curriculum. 4(1-6) F.* Design concepts are applied to current agricultural engineering problems. One major design project is combined with a variety of case studies and short term design problems. ROHRBACK

BAE 452 Agricultural Engineering Design II. *Preq: BAE 451. 2(0-4) S.* Continuation of BAE 451. The major design problem solution is evaluated under actual problem conditions and the student is required to assess the effectiveness of the design. ROHRBACK

BAE 462 Functional Design of Field Machines. *Preq: BAE 361, Coreq: ST 361. 3(2-3) S.* Design of modern farm tractors and field machines that make effective use of energy and labor in farm commodities production. Topics include (a) engine cycles, Nebraska test procedures, traction efficiencies, rolling resistances, and hitching of tractors and (b) principles and devices used to accomplish functional objectives in tillage, planting, pesticide application, and harvesting equipment. BOWERS

BAE (CHE) 465 Introduction to Biomedical Engineering. *Preqs: MA 202 or MA 212, PY 212 or PY 208. 3(3-0) S.* (See chemical engineering). RICHARDSON

BAE 471 Soil and Water Engineering. *Preqs: BS 100, SSC 200, MAE 308. 4(3-2) F.* Aspects of hydrology, soil-water-plant relationships, soil and water conservation engineering, drainage, irrigation, and agricultural water pollution. Applications of hydraulics, pipe flow and open channel flow principles in design of soil and water conservation structures, and agricultural water management. WESTERMAN

BAE 481 Agricultural Structures and Environment. *Preqs: BAE 342, MAE 314. 4(3-3) F.* Principles of environmental control and structural analysis are combined with biological principles for the design of agricultural structures. Topics include structural analysis, load estimation, material selection, fasteners, physiological reactions of animals and plants to their environment, applications of heat transfer and psychrometrics in calculating ventilation requirements, heating or cooling loads, and farmstead planning. BAUGHMAN

BAE 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

BAE 493 Special Problems in Biological and Agricultural Engineering. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

BAE 495 Special Topics in Biological and Agricultural Engineering. *Preq: Consent of Instructor. 1-3 F,S,Sum.* Offered as needed to present new or special Biological and Agricultural Engineering subject matter.

Selected 500-Level Courses Open To Advanced Undergraduates

BAE 522 Mechanics of Biological Material. *Preq: PY 205, BS 100, MA 242. 3(2-2) Alt. F.*

BAE 552 Instrumentation for Agricultural Research and Processing. *Preqs: ECE 331, MA 301. 2(1-3) F.*

BAE (CE, MB) 570 Sanitary Microbiology. *Preq: MB 401 or equivalent. 3(2-3) S.*

BAE (CE) 578 Agricultural Waste Management. *Preq: Grad. or advanced undergrad. standing. 3(2-3) Alt. F.*

BAE (FS) 585 Food Rheology. *Preqs: FS 331 or MAE 314. 3(2-3) Alt. F.*

BAE 590 Special Problems. *Preq: Sr. or grad. standing in biological and agricultural engineering. Credits arranged.*

BIOCHEMISTRY

BCH 150 Introductory Biochemical Concepts. *Preq: Enrollment limited to freshmen and sophomores in BCH, Coreq: CH 101. 2(2-0) S.* An introduction to concepts and perspectives in biochemistry, designed to provide students with an overview of biology at the molecular level.

BCH 451 Introductory Biochemistry. *Preq: CH 223. 3(3-0) F,S,Sum.* Introduction to the fundamentals of biochemistry, dealing with the chemistry of living organisms, structures and interactions of biomolecules. HORTON, KNOPP

BCH 452 Introductory Biochemistry Laboratory. *Preq. or Coreq: BCH 451. 2(1-3) F,S.* Laboratory experience to complement BCH 451. Basic skills in the use of volumetric equipment, spectrophotometers, chromatography, and electrophoresis. Manipulation and assay of small quantities of biological materials, and analysis of laboratory data. KNOPP

BCH 453 Introduction to Molecular Biology and Metabolism. *Preq: BCH 451. 3(3-0) S.* Introduction to metabolic relationships (including nitrogen and lipid metabolism), molecular biology, and methodologies of recombinant DNA research. OTVOS

BCH 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and academic dean prior to the experience.

BCH 493 Special Problems in Biochemistry. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

BCH 495 Special Topics in Biochemistry. *1-3 F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

Selected 500-Level Courses Open To Advanced Undergraduates

BCH 540 Proteins. *Preq: BCH 451 or equivalent. 2(2-0) F.*

BCH 541 Nucleic Acids. *Preq: BCH 451 or equivalent. 2(2-0) F.*

BCH 542 Metabolism. *Preq: BCH 451 or equivalent. 2(2-0) S.*

BCH 543 Regulation. *Preq: BCH 451 or equivalent. 2(2-0) S.*

BCH 552 Experimental Biochemistry. *Preq: CH 223; CH 315 recommended; Preq. or Coreq: BCH 551. 3(1-6) F.*

BCH 554 Radioisotope Techniques in Biology. *Preq: BCH 451 or CI. 2(1-3) Sum.*

BCH 590 Special Topics in Biochemistry. *Preq: BCH 451 or equivalent. Credits arranged, maximum 3. F,S,Sum.*

BIOMATHEMATICS

Selected 500-Level Courses Open to Advanced Undergraduates

BMA (BO) 567 Modeling of Biological Systems. *Preq: MA 112. 4(3-2) S, Alt. yrs.*

BMA (MA, ST) 571 Biomathematics I. *Preq: Advanced calculus, reasonable background in biology or CI. 3(3-0) F.*

BMA (ST, MA) 572 Biomathematics II. *Preq: BMA 571. 3(3-0) S.*

BMA (ST, OR) 575 Decision Analytic Modeling. *Preqs: MA 421 or ST 421 and ST 507 or ST 511 or ST 515.*

BMA 591 Special Topics. *Preq: CI. Maximum 3. F, Alt. yrs.*

BOTANY

BO 200 Plant Life. *4(3-3) F,S,Sum.* An introduction to the structure, processes, and reproduction of higher plants, including the diversity of the plant kingdom and principles of inheritance, ecology, and evolution. STUCKY, VAN DYKE

BO 213 Plants and Civilization. *Preqs: BS 100, BS 105 or BO 200. 3(3-0) S.* Economic, social, political, religious, and medical roles of plants and plant products in human civilization. Foods, beverages, drugs, fibers, oils, latexes, religious symbols and elements. BECKMANN

BO (ZO) 360 Introduction to Ecology. *Preq: A 200 level biology course. 3(3-0) F,S,Sum.* Relationships between organisms and environment, and interactions among organisms. Emphasis on basic principles, including energy flow, nutrient cycling, community structure and organization, succession, and population dynamics. Ecological consequences of human activities. MOZLEY, WENTWORTH

BO (ZO) 365 Ecology Laboratory. *Coreq: BO (ZO) 360. 1(0-3) F,S,Sum.* Laboratory coordinated with BO (ZO) 360 lecture, illustrates basic principles of environmental measurement, data analysis, limiting factors, adaptation, biogeography, succession, populations, communities, ecosystems, and competition and predation by means of field trips and laboratory experiments. MOZLEY, WENTWORTH

BO 400 Plant Diversity. *Preq: BO 200. 4(3-3) F.* A comprehensive survey of the vegetative and reproductive diversity of the plant kingdom. Emphasis is placed on evolutionary trends, adaptive strategies, and bases for assumed phylogenetic relationships, considering fossil as well as living forms. HARDIN

BO 403 Systematic Botany. *Preq: BS 100 or 105 or BO 200. 4(2-4) S.* Systematic survey of vascular plants, emphasizing terminology, family characteristics, field identification, general evolutionary relationships, and mechanisms of plant speciation. HARDIN

BO 413 Introductory Plant Anatomy. *Preq: BO 200. 4(3-3) S.* Organelles, cells, tissue systems, and organs of flowering plants and selected gymnosperms. Microscope use on fresh, cryostat, and prepared plant sections. Histochemistry of plant cells and tissues. ANDERSON

BO (ZO) 414 Cell Biology. *Preqs: CH 223, PY 212, ZO 201, or 203. 3(3-0) F.* (See zoology.)

BO 421 Plant Physiology. *Preqs: BS 100, BS 105 or BO 200; one year of college chemistry. 4(3-3) F,S,Sum.* Physiology of higher plants with emphasis on structure-function relationships, water and solute relationships, metabolism, photosynthesis, and nutrition. Plant growth and development as influenced by plant growth regulators and environmental factors. FITES, TROYER

BO 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

BO 493 Special Problems in Botany. *Preq: Sophomore standing. 1-6 F,S.* A learning experience within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

BO 495 Special Topics in Botany. *Preqs: 8 hrs. of Botany courses. 1-6 F,S,Sum.* Individualized study, under faculty supervision, of botanical topics in the student's area of interest and not covered in existing courses. Development of a new course on a trial basis.

Selected 500-Level Courses Open To Advanced Undergraduates

BO 510 Plant Anatomy. *Preq: BO 200. 4(3-3) F.*

BO 522 Advanced Morphology and Phylogeny of Seed Plants. *Preq: BO 403. 4(3-3) F. Odd yrs.*

BO 544 Plant Geography. *Preqs: BO 403, BO (ZO) 360, GN 411 or equivalents. 3(3-0) S. Even yrs.*

BO 551 Advanced Plant Physiology I. *Preqs: BO 421 or equivalent. 3(3-0) F.*

BO 552 Advanced Plant Physiology II. *Preq: BO 421 or equivalent and biochemistry. 3(3-0) S.*

BO 554 Laboratory in Advanced Plant Physiology II. *Preq. or coreq: BO 552. 1(0-3) S.*

BO (ZO) 560 Principles of Ecology. *Preq: Three semesters of college level biology courses. 4(3-3) F.*

BO 561 Physiological Ecology. *Preqs: BO 421 and BO (ZO) 560 or equivalent. 4(3-3) S. Odd yrs.*

BO 565 Plant Community Ecology. *Preq: BO (ZO) 560 or BO (ZO) 360 or equivalent. 4(3-3) F.*

BO (BMA) 567 Modeling of Biological Systems. *Preq: MA 112. 4(3-2) F.*

BO (MB) 574 Phycology. *Preq: BS 100 or BO 200. 3(1-4) S. Odd yrs.*

BO (MB, PP) 575 The Fungi. *Preq: BO 200 or equivalent. 3(3-0) F.*

BO (MB, PP) 576 The Fungi—Lab. *Coreq: BO 575. 1(0-3) F.*

BO 590 Topical Problems. *Preq: CI. 1-3 F,S.*

BIOLOGICAL SCIENCES

BS 100 General Biology. *Students may not receive credit for both BS 100 and BS 105. 4(3-3) F,S,Sum.* Basic principles and concepts of biology, including the structure and function of cells and organisms, development, heredity, evolution, and ecology.
BECKMANN, FEAVER, HANING, LYTLE, PARKER

BS 105 Biology in the Modern World. *For non-science students. Students may not receive credit for both BS 105 and BS 100. 4(3-3) F,S.* Principles and concepts of biology including cellular structure and function, metabolism and energy transformation, homeostasis, reproduction, heredity, diversity of life, ecology, evolution and animal behavior. Emphasis on human affairs and human examples. MICKLE

BS 292 Special Topics in Life Science. *Preq: Permission of Instructor. 1-3 F,S.* Special interest courses and trial offerings of new or experimental courses in life science.

BS 491 Seminar on Professional Development in Biological Sciences. *1(1-0) F.* Planning and analyzing strategies for professional development in the biological sciences utilizing discussion, guest lecturers, and field trips to nearby research laboratories and industrial plants. Intended primarily for juniors and seniors in any biological discipline.
LYTLE

BS 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within a academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

BS 493 Special Problems in Biological Sciences. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

BS 495 Special Topics in Biology. *1-6 F,S,Sum.* Independent study projects in biology conducted under the supervision of a faculty member and experimental courses in biological science. Student projects to be selected with the assistance of an appropriate faculty member and with the approval of the Coordinator of the Biological Science Program.

Selected 500-Level Courses Open To Advanced Undergraduates

BS 510 Advanced Biology for Secondary Teachers. *Preq: Two years of college biology. 6(4-6) Sum.*

BS 590 Special Problems in Biological Instrumentation. *Preq: CI. 1-3 F,S.*

CIVIL ENGINEERING

CE 200 Civil Engineering, Measurements, and Surveys. *Preq: CSC 110 or CSC 111, MA 241. 3(2-3) F,S.* The elements of plane surveying, topographical surveying, horizontal and vertical curves, construction surveys, earthwork, photogrammetry, property and subdivision surveys, route surveying and state coordinate system. GALLER

CE 202 Computer Applications in Civil Engineering. *Preq: MA 241. Must be taken not later than fifth semester of CE department curriculam (first semester of junior year). 3(2-2) F,S,Sum.* Introduction to methodical problem solving, emphasizing computer programming with applications in Civil Engineering specialty areas. GALLER

CE 213 Introduction to Mechanics. *Coreq: MA 242. Not for CE department majors. 3(3-0) F,S,Sum.* Introductory study of the state of rest or motion of bodies subjected to the

action of forces. The nature and properties of force systems, free body diagrams, the concepts of equilibrium, the motion of particles, the role of Newton's laws, the conservational principles in mechanics, and mechanical vibrations. HORIE

CE 214 Engineering Mechanics-Statics. *Preq: PY 205; Coreq: MA 242. 3(3-0) F,S,Sum.* Basic force concepts and equilibrium analysis; distributed forces; centroids; moments of inertia; application to structural elements. BINGHAM

CE 215 Engineering Mechanics-Dynamics. *Preq: A grade of C or better in CE 214; Coreq: MA 242. 3(3-0) F,S,Sum.* Kinematics and kinetics of particles; plane kinematics and kinetics of rigid bodies; simple vibrations and selected topics from three-dimensional rigid body dynamics, steady and variable mass flow, and orbital motion. ELY

CE 305 Traffic Engineering. *Preq: CE 200. 3(2-2) F,S.* Integrated approach to planning, design, and operation of transportation systems with an emphasis on highway and street systems. Roadway design, traffic operations and performance, and control systems. CRIBBINS, STONE

CE 313 Mechanics of Solids. *Preq: A grade of C or better in CE 214; Coreq: MA 242. 3(3-0) F,S,Sum.* Elementary analysis of deformable solids subjected to force systems. Concepts of stress and strain; one, two and three-dimensional stress-strain relationships for the linear elastic solid. Statically determinate and indeterminate axial force, torsion and bending members. Stress transformations, pressure vessels, combined loadings. Introduction to column buckling. DOUGLAS

CE 324 Structural Behavior Measurement. *Preq: MAT 200; Coreqs: CE 215, CE 325. 1(0-3) F,S,Sum.* Introduction to experimental techniques: strain measurement in structural members, strain and displacement measurements in frames and trusses, frequency and damping measurements in beams. Where appropriate, experimental results will be applied to theoretical predictions. BINGHAM, MATZEN

CE 325 Structural Analysis. *Preqs: CSC 110 or CSC 111 and CE 313. 3(3-0) F,S.* Analysis of internal forces of statically determinate trusses, beams and framed structures. Analysis of deformations by methods of virtual work and conjugate beam. Indeterminate structural analysis of trusses, beams and rigid frames by force and displacement methods. BINGHAM, ELY, SMITH, TUNG

CE 327 Reinforced Concrete Design. *Preqs: CE 325, CE 332. 3(3-0) F,S,Sum.* Behavior, strength, and design of reinforced concrete members subjected to moment, shear, and axial forces. Introduction to the design of reinforced concrete structures. AHMAD, NAU, SCHULTZ, SMITH

CE 332 Materials of Construction. *Preqs: MAT 200 and CSC 110 or CSC 111. 3(2-3) F,S,Sum.* Manufacture and properties of mineral and bituminous cements and mineral aggregates. Mechanical properties and durability of portland cement concrete, bituminous mixtures, masonry units, timber products, and miscellaneous construction materials. Materials testing. KHOSLA, LEMING

CE 333 Properties of Construction Materials. *Preq: CE 313. Not open to students enrolled in B.S. in Civil Engineering or Civil Engineering-Construction Option programs. A student may not receive credit for both CE 332 and CE 333. 3(2-3) F.* Manufacture and properties of mineral and bituminous cements and mineral aggregates. Mechanical properties, durability and testing of portland cement concrete, brick, bituminous mixtures, timber products, and steel. KHOSLA

CE 342 Engineering Behavior of Soils and Foundations. *Preq: CE 313; Coreq: CE 332. 4(3-2) F,S, Sum.* Soil properties and mechanics of analysis related to engineering behavior of soils. Includes soil identification, classification, index properties, effective stress concepts, settlement analysis, evaluation of shear strength and bearing capacity, and fundamentals of foundation selection and design. BORDEN, LAMBE, RAHMAN

CE 367 Mechanical and Electrical Systems in Buildings. *Preq: PY 208. 3(3-0) S.* Introduction to mechanical and electrical systems in building construction. Includes

HVAC, lighting and electrical systems, focusing on design concepts, equipment application and design of the construction process for modern building systems.

CE 375 Civil Engineering Systems. *Preq: CSC 110; Coreqs: MA 341. 3(3-0) F,S.* A broad perspective, systematic approach to civil planning, analysis, evaluation and design for large scale projects in construction, structures, transportation, water resources and other civil engineering areas. GALLER, McDONALD, STONE

CE 381 Hydraulics Systems Measurements Lab. *Coreq: CE 382. 1(0-3) F,S,Sum.* Introduction to experimental techniques for the analysis of hydraulic systems; measurement of viscosity, fluid pressures, velocity distributions, flow rates; investigations into the friction, momentum transfer, and turbulence on fluid flow.

CE 382 Hydraulics. *Preqs: CE 215, MA 341 3(3-0).* Fluid properties; mass, energy and momentum conservation laws; dimensional analysis and modeling; laminar and turbulent flows; surface and form resistance; flow in pipes and open channels; elementary hydrodynamics; fluid measurements; characteristics of hydraulic machines. AMEIN, McDONALD, OVERTON

CE 383 Hydrology and Urban Water Systems. *Preq: CE 382. 3(3-0) F,S.* Engineering hydrology and design of elements of urban water systems. Applications in stormwater collection, channel design, flood control and water supply. Effects of watershed development on quantity and quality of streamflow. FISHER, MALCOM

CE 400 Transportation Engineering Project. *Preqs: CE 375, CE 406. 3(1-4) F,S.* Integrated team approach to design of major transportation engineering projects. Professional topics in transportation engineering practice. CRIBBINS, HORN, STONE

CE 406 Transportation Systems Engineering. *Preq: CE 305. 3(3-0) F,S.* Multi-modal transportation systems; railroads, airports, highways, and other modes. Planning, analysis, and design. Fundamental concepts; supply, demand, flows, impacts, and network optimization. STONE

CE 420 Structural Engineering Project. *Preqs: CE 327, CE 375, CE 426. 3(2-2) F,S.* Planning, analysis and design of complete structural systems composed of steel and reinforced concrete. Professional topics in structural engineering practice. NAU, SMITH

CE 425 Intermediate Structural Analysis. *Preq: CE 325. 3(3-0) F,S.* A rigorous treatment, at intermediate level, of indeterminate structural analysis. Coverage includes methods for calculating displacements, force and displacement methods of indeterminate analysis, approximate methods of indeterminate analysis, Maxwell-Betti reciprocal theorem, qualitative influence lines, and introduction to structural vibrations. MATZEN

CE 426 Structural Steel Design. *Preq: CE 325. 3(3-0) F,S.* Design and behavior of structural steel members and their connections subjected to moment, shear, and axial forces. Introduction to the design of steel structures. NAU, SCHULTZ, SMITH

CE 428 Structural Design in Wood. *Preq: CE 325. 3(3-0) S.* Structural behavior of wood under loads; design of structural elements in wood; mechanical properties of wood fasteners and connections; design projects using clear wood, plywood and glue-laminated wood. ZIA

CE 440 Geotechnical Engineering Project. *Preq: CE 375; Coreq: CE 443. 3(1-4) F,S.* Integrated team approach to major geotechnical engineering projects involving site selection, analysis and design of foundations and earth structures, establishment of performance criteria, economic analysis, identification of potential construction problems, and matters regarding professional practice and ethics. BORDEN, LAMBE, RAHMAN, WAHLS

CE 443 Seepage, Earth Embankments and Retaining Structures. *Preq: CE 342. 3(3-0) F,S.* Review of shear strength concepts; ground water hydraulics; slope stability; lateral earth pressure problems; placement of fills. LAMBE

CE 463 Construction Estimating, Planning and Control. *Preq: CSC 110 or 111 and junior standing. 3(2-3) F,S.* Principles of cost engineering, project estimating, bid procedures, construction cost analysis and control. FARID, JOHNSTON

CE 464 Legal Aspects of Contracting. *Preq: Sr. standing. 3(3-0) F,S.* Legal aspects of contract documents, drawings and specifications; owner-engineer-constructor relationships and responsibilities; bids and contract performance; labor laws; governmental administrative and regulatory agencies; torts; business organizations; ethics and professionalism.

CE 465 Construction Equipment Methods. *Preqs: CE 332 and CSC 110 or 111. 3(3-0) F,S.* Introduction to construction engineering emphasizing heavy and highway construction: the construction industry, contract construction, project planning and scheduling; construction equipment, methods and management; safety and environmental health in construction. FARID

CE 466 Building Construction Engineering. *Coreq: CE 327. 3(2-2) F,S.* An introduction to building design and construction including organization and management, the building development process, materials and methods of building construction. JOHNSTON

CE 469 Construction Engineering Project. *Preqs: CE 463; Coreq: CE 464. For CEC and CM students in their last semester. F,S.* Integrated approach by student teams to design, estimating, planning, scheduling, and management of construction projects.

CE 480 Water Resources Engineering Project. *Preqs: CE 305, CE 342, CE 375, CE 383; Coreq: CE 484. 3(1-4) F,S.* Engineering design of selected projects in water resources engineering, involving interactions with other CE specialty areas. Project subjects include sitework, floodwater reservoirs, and one selected by the student. Professional topics in water resources engineering practice. MALCOM

CE 484 Water Supply and Waste Water Systems. *Preq: CE 383. 3(3-0) F,S.* Elements of the design of water supply and wastewater disposal systems. CHAO, BORDEN

CE 487 Introduction to Coastal and Ocean Engineering. *Preqs: Senior standing and CE 382. 3(3-0) S.* Introduction to design and analysis of civil engineering projects in the ocean and along the coastline. Basic wave mechanics, tides, and ocean dynamics as applied to the understanding of coastal erosion control and other marine problems. An optional two-day field trip to the North Carolina Outer Banks at a nominal student expense is a regular feature of the course. FISHER, OVERTON

CE 497 Current Topics in Civil Engineering. *Preq: Permission of Instructor. 1-4 F,S,Sum.* Presentation of material not normally available in regular course offerings or offering of new courses on a trial basis. Credits and content determined by faculty member in consultation with the Department Head.

CE 498 Special Problems in Civil Engineering. *Preq: Sr. standing. 1-4 F,S.* Directed reading in the literature of civil engineering, introduction to research methodology, seminar discussion dealing with special civil engineering topics of current interest.

Selected 500-Level Courses Open To Advanced Undergraduates

CE 501 Transportation Systems Analysis. *Preq: CE 406. 3(3-0) F.*

CE 502 Transportation Operations. *Preq: CE 406. 3(3-0) S.*

CE 503 Transportation Design. *Preq: CE 406. 3(2-3) S.*

CE 504 Water Transportation. *Preq: CE 305. 3(3-0) F.*

CE 507 Airphoto Analysis I. *Preq: Sr. standing. 3(2-3) S.*

CE 511, 512 Continuum Mechanics I, II. *Preqs: CE 313 or MAE 314, CE 382 or MAE 308, MAE 301, MA 405. (511) 3(3-0) F; (512) 3(3-0) Alt. S.*

CE 513 Theory of Elasticity I. *Preq: CE 313 or MAE 314. 3(3-0) S.*

CE 514 Stress Waves. *Preqs: MA 341; CE 313 or PY 411 or MA 401 or MEA 351. 3(3-0) F, Alt. Yrs.*

CE 521 Advanced Strength of Materials. *Preq: CE 313 or MAE 314. 3(3-0) F.*

CE 522 Elastic Stability. *Preqs: CE 521, MA 341, 405. 3(3-0) S.*

CE 524 Analysis and Design of Masonry Structures. *Coreq: CE 420. 3(3-0) Alt. F.*

CE 525 Matrix Structural Analysis. *Preq: CE 425. 3(3-0) F.*

CE 526 Finite Element Methods for Civil Engineering. *Preqs: CE 425 and prior programming knowledge. 3(3-0) S.*

CE 527 Analysis and Design of Structures for Dynamic Loads. *Preq. or coreq: CE 525. 3(3-0) F.*

CE 531 Structural Models. *Preq: CE 420. 3(2-3) F.*

CE 534 Plastic Analysis and Design. *Preq: CE 420. 3(3-0) S.*

CE 536 Theory and Design of Prestressed Concrete. *Coreq: CE 420. 3(3-0) F.*

CE (MEA) 541 Gravity Wave Theory I. *Preq: MAE 308 or PY 411. 3(3-0) S.*

CE 544 Foundation Engineering. *Preq: CE 342. 3(3-0) S.*

CE 548 Engineering Properties of Soils I. *Preq: CE 342. 3(2-3) F.*

CE 551 Theory of Concrete Mixtures. *Preq: CE 332. 3(3-0) F.*

CE 553 Asphalt and Bituminous Materials. *Preq: CE 332. 3(2-3) S.*

CE 555 Highway and Airport Pavement Design. *Preq: CE 406 or 443. 3(2-3) F.*

CE 561 Construction Planning and Scheduling. *Preq: CE 463. 3(3-0) F.*

CE 562 Construction Productivity. *Preq: CE 463 or equivalent. 3(3-0) F.*

CE 566 Building Construction Systems. *Preq: CE 466 or CE 420 or grad. standing in ARC. 3(3-0) S.*

CE (BAE, MB) 570 Sanitary Microbiology. *Preq: MB 401 or equivalent. 3(2-3) S.*

CE 575 Civil Engineering Systems. *Preq: MA 405. 3(3-0) S.*

CE 580 Flow in Open Channels. *Preq: CE 382. 3(3-0) F.*

CE 582 Coastal Hydrodynamics. *Preq: CE 382 or equivalent. 3(3-0) F.*

CE 583 Engineering Aspects of Coastal Processes. *Preq: CE 382 or equivalent. Coreq: MEA (CE) 541. 3(3-0) S.*

CE 584 Hydraulics of Ground Water. *Preq: CE 382 or 342 or equivalent. 3(3-0) S.*

CE 585 Urban Stormwater Management. *Preq: CE 383. 3(3-0) F.*

CE 586 Engineering Hydrology. *Preq: CE 383. 3(3-0) F, Alt. yrs.*

CE 589 Special Topics in Civil Engineering. *3(3-0) F,S.*

CE 591, 592 Civil Engineering Seminar. *1(1-0) F,S.*

CE 598 Civil Engineering Projects. *1-6 F,S.*

FOREST RESOURCES

CFR 110-111 Forest Resources Scholars Forum. *Enrollment limited to participants in the Scholars Program. 0(2-0) F,S.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern. WELLMAN

CFR 134 Computers in Natural Resources. *Freshmen and first semester transfer students only. 1(0-3) F,S.* Forestry, wood science, recreation, and natural resource computer applications and exercises using word processing, spreadsheets, and database management programs. Introduction to microcomputer operating systems, specific application packages, and BASIC computer language. ROISE, STAFF

CFR 210-211 Forest Resources Scholars Forum. *Enrollment limited to participants in the Scholars Program. 0(2-0) F,S.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern. WELLMAN

CHEMISTRY

CH 100 Chemistry and Society. *4(4-0) F,S,Sum.* Designed to acquaint the non-science majors with the basic subject matter of chemistry and to indicate how this knowledge relates to their professions. Selected chemical concepts are developed in depth with both fundamental principles and practical consequences given nearly equal weight.

CH 101 General Chemistry I. *Preq: MA 111 with a grade of C or better. 4(3-3) F,S,Sum.* Fundamental chemical concepts of composition and stoichiometry; atomic structure; bonding and molecular structure, including stereochemistry; chemical reactions; states of matter, including solutions. Should be followed by CH 103, 105, or 107.

CH 103 General Chemistry II. *Preq: CH 101. 4(3-3) F,S,Sum.* Terminal course for students in curricula which do not require full-year chemistry courses beyond the freshman level. Acid-base reactions, homogeneous and heterogeneous equilibria, electrochemistry, and descriptive aspects of inorganic, organic, nuclear and biochemistry.

CH 104 Experimental Chemistry. *Preq: CH 101; Coreq: CH 105. 1(0-3) F,S,Sum.* Laboratory supplement to CH 105. Required for CH 105 students who plan to take additional chemistry courses.

CH 105 Chemistry Principles and Applications. *Preq: CH 101 with a grade of C or better. Credit cannot be received for both CH 105 and either CH 103 or CH 107. 3(3-0) F,S,Sum.* A continuation of CH 101, intended primarily for engineering students. Emphasis on introductory chemical thermodynamics, equilibrium, electrochemistry, chemical kinetics, and the application of basic chemical principles to the treatment of organic and inorganic systems. CH 105 serves as prerequisite for additional chemistry courses only if supplemented by CH 104.

CH 106 Computer Applications in Chemistry I. *Preq: CH major; Coreq: CH 101. 1(0-3) F.* A supplement to CH 101 laboratory, for chemistry majors. An introduction to the use of computers in chemistry for data analysis, graphical data display, report preparation, and bibliographic searching.

CH 107 Principles of Chemistry. *Preq: CH 101 with a grade of C or better. 4(3-3) F,S.* Emphasizes detailed quantitative aspects of solution stoichiometry, kinetics, equilibrium, electrochemistry and thermodynamics and the treatment of acid-base chemistry.

CH 108 Computer Applications in Chemistry II. *Preqs: CH 106, CH major; Coreq: CH 107. 1(0-3) S.* A supplement to CH 107 laboratory, for chemistry majors. The use of computers in mathematical modeling of chemical concepts; applications of computer graphics to structure drawing, molecular modeling, and scientific illustration.

CH 211 Analytical Chemistry I. *Preq: CH 107, CH major; Coreq: CH 108 and PY 205. Credit is not allowed for both CH 211 and CH 315. 3(2-3) S.* Methods of quantitative analysis based on solution chemistry, potentiometry, coulometry and molecular absorption spectroscopy. Statistics of measurement precision. The laboratory emphasizes the precision obtainable with both classical and instrumental methods of analytical chemistry and the use of computers in chemistry.

CH 220 Introductory Organic Chemistry. *Preqs: CH 103 or 107, or CH 104 in place of 105. Credit is not allowed for both CH 220 and CH 221. 4(3-3) F,S,Sum.* A one-semester course in the fundamental principles of organic chemistry. Preparation, reactions, and physical properties of alkanes, cycloalkanes, alcohols, alkyl halides, aromatic compounds, aldehydes, ketones, organic acids, acid derivatives, and amines.

CH 221 Organic Chemistry I. *Preq: CH 107. Credit is not allowed for both CH 220 and CH 221. 4(3-3) F,S,Sum.* First half of two semester sequence in the fundamentals of modern organic chemistry. Structure and bonding, stereochemistry, reactivity and synthesis of carbon compounds. *Detailed coverage* of aliphatic hydrocarbons, alcohols, ethers, and alkyl halides. *Introduction to* spectral techniques.

CH 223 Organic Chemistry II. *Preq: CH 221. 4(3-3) F,S,Sum.* Second half of a two semester sequence in modern organic chemistry. Continuation of mechanistic approach to reactions and synthesis of organic compounds. Detailed coverage of carbonyl compounds (aldehydes, ketones, acids), aromatic chemistry and amines. Spectral techniques employed throughout.

CH 295 Special Problems in Chemistry. *Preq: Consent of Department. 1-3 F,S.* Special topics in chemistry at the early undergraduate level. Trial offerings of new or experimental courses in chemistry.

CH 315 Quantitative Analysis. *Preqs: CH 103 or 107, or CH 104-105. Credit is not allowed for both CH 211 and CH 315. 4(3-3) F,S,Sum.* Fundamental principles and modern techniques of chemical analyses: spectrochemical, electrochemical, and volumetric methods of analysis, modern chemical instrumentation, and interpretation of data.

CH 331 Introductory Physical Chemistry. *Preqs: CH 103 or 107, or CH 104-105; MA 241 or 212; PY 205 or PY 211 or PY 221. 4(3-3) F,S.* Basic physicochemical principles including chemical thermodynamics, physical and chemical equilibrium, electrochemistry and reaction kinetics. For students who require only a single semester of physical chemistry.

CH 401 Systematic Inorganic Chemistry I. *Coreq: CH 431 or CH 331. 2(2-0) F.* Descriptive chemistry of the elements with particular attention to their reactions in aqueous solution. Emphasis on the chemistry of the main group elements and the periodicity of their chemical properties.

CH 402 Inorganic Chemistry Laboratory. *Coreq: CH 401. 1(0-3) F.* A laboratory program to accompany CH 401, for B.S. chemistry majors. Synthetic techniques including inert atmosphere, electrolysis, high-temperature, and ion-exchange illustrated by application to main-group and transition metal complexes and to other main-group compounds.

CH 403 Systematic Inorganic Chemistry II. *Preq: CH 401. 3(3-0) S.* Development and application of theoretical principles to the structure and energies of inorganic substances. Particular attention to the chemistry of coordination compounds of the transition elements.

CH 415 Analytical Chemistry II. *Preq: CH 211; Coreq: CH 416, CH 433. 3(3-0) F.* Methods of quantitative analysis based on electronic instrumentation. Discussion of atomic spectroscopy, fluorescence, electrochemistry and chromatography as well as statistical methods of data handling and experiment design and an introduction to electronic components and chemical transducers. Other topics include immunoassay, surface analysis and mass spectroscopy.

CH 416 Analytical Chemistry Laboratory. *Coreq: CH 415. 2(0-6) F.* Experiments in spectroscopy, electrochemistry, chromatography and electronics; computer applications to experimental design and data smoothing.

CH 428 Qualitative Organic Analysis. *Preq: CH 223. 3(1-6) F,S.* Introduction to the systematic identification and separation of organic compounds by the application of both physical and chemical techniques. Infrared and nuclear magnetic spectroscopy, chemical classification tests, and the preparation of derivatives are used to acquaint the student with organic research methods.

CH 431 Physical Chemistry I. *Preqs: CH 107, MA 241, PY 203 or 208; Coreq: MA 341. 3(3-1) F,S.* An intensive study of physical chemical principles including states of matter, classical thermodynamics, physical and chemical equilibria, and electrochemistry.

CH 433 Physical Chemistry II. *Preqs: CH 431, MA 341. Credit may not be claimed for both CH 433 and CH 437. 3(3-1). F,S.* An intensive study of physical chemical principles

including molecular spectroscopy, statistical thermodynamics, reaction kinetics, kinetic theory, and transport properties.

CH 434 Physical Chemistry Laboratory. *Preq: CH 431; Coreq: CH 433. 2(0-4) F,S.* A project-oriented course to acquaint students with modern physical chemistry techniques. Experiments in chemical thermodynamics, kinetics and molecular structure are carried out and analyzed.

CH 435 Introduction to Quantum Chemistry. *Preqs: MA 341; PY 208 or PY 203. 3(3-0) F.* An introduction to the basic principles of quantum theory and its application to atomic and molecular structure and spectroscopy.

CH 437 Physical Chemistry for Engineers. *Preqs: PY 208, CHE 315, MA 341. Credit may not be claimed for both CH 433 and CH 437. 4(4-0) F,S.* Selected physiochemical principles including quantum theory, statistical thermodynamics, kinetic theory, transport phenomena and rates of chemical reactions.

CH (TC) 461 Introduction to Fiber-Forming Polymers. *Preq: CH 223. 4(3-3) F.* (See textile chemistry.)

CH 491 Honors Chemistry. *Preq: Senior in Chemistry and admission to Honors Program. 1-3 F,S.* Independent study and research projects in chemistry. Honors students must register for this course in both Fall and Spring Semesters of their senior year.

CH 495 Special Topics in Chemistry. *Preq: CI. 1-3 F,S.* To serve needs not covered by existing courses.

CH 499 Undergraduate Research in Chemistry. *Preq: Two years of chemistry and departmental approval. Credits Arranged. 1-3 F,S,Sum.* Independent investigation of a research problem under the supervision of a chemistry faculty member.

Selected 500-Level Courses Open To Advanced Undergraduates

CH 501 Advanced Inorganic Chemistry I. *Preq: CH 433. 3(3-0) F.*

CH 503 Advanced Inorganic Chemistry II. *Preq: CH 501. 3(3-0) S.*

CH 515 Chemical Instrumentation. *Preq: CH 431; Coreq: CH 411. 3(3-0) S.*

CH 517 Physical Methods of Elemental Trace Analysis. *Preq: CH 315 or 331. 3(3-0) F.*

CH 521 Advanced Organic Chemistry I. *Preqs: CH 223, 433 or 435. 3(3-0) F.*

CH 525 Physical Methods in Organic Chemistry. *Preqs: CH 223 and 433 or 435. 3(3-0) S.*

CH 531 Chemical Thermodynamics. *Preqs: CH 433, MA 341. 3(3-0) F.*

CH 533 Chemical Kinetics. *Preqs: CH 433, MA 341. 3(3-0) Alt. S.*

CH 535 Surface Phenomena. *Preqs: CH 433, MA 341. 3(3-0) Alt. S.*

CH 536 Chemical Spectroscopy. *Preq: CH 435. 3(3-0) Alt. S.*

CH 537 Quantum Chemistry. *Preqs: MA 341, CH 435 or PY 407. 3(3-0) S.*

CH 539 Colloid Chemistry. *Preq: CH 220, 315 or 331, or CI. 3(2-3) Alt. S.*

CH (TC) 562 Physical Chemistry of High Polymers-Bulk Properties. *Preq: CH 220 or 223, CH 331 or 431. 3(3-0) F.*

CHEMICAL ENGINEERING

CHE 205 Chemical Process Principles. *Preqs: MA 241, PY 205, CH 107; Coreq: MA 242. 4(3-2) F,S,Sum.* Engineering methods of treating material balances, stoichiometry, phase equilibrium calculations, thermophysics, thermochemistry and the first law of thermodynamics. Introduction to computers and a computer language for solving problems related to the course material. Initial stages of process design through a comprehensive case study.

CHE 225 Chemical Process Systems. *Preq: C or better in CHE 205; Coreq: MA 341. 3(2-2) F,S,Sum.* Introduction to methods of measuring chemical variables, analyzing process data, and formulating mathematical models of process systems. Instrumental measurement methods. Elementary statistical data analysis. Dynamic process system behavior. Computer simulation of steady-state and dynamic processes.

CHE 311 Transport Processes I. *Preqs: MA 341, PY 208, and a grade of C or better in CHE 205. 3(3-0) F,S.* Fundamental aspects of momentum and heat transfer, and the use of these fundamentals in solving problems in transport operations.

CHE 312 Transport Processes II. *Preq: CHE 311; Coreq: CHE 316. 3(3-0) F,S.* Fundamental aspects of mass transfer and the use of these basic principles in solving problems in transport operations.

CHE 315 Chemical Process Thermodynamics. *Preqs: MA 341, C or better in CHE 205. 3(3-0) F,S.* Laws of thermodynamics and their application to chemical engineering problems, both in theory and in practice. Criteria of equilibrium in physical and chemical changes. Behavior of real fluids, including mixtures.

CHE 316 Thermodynamics of Chemical and Phase Equilibria. *Preq: CHE 315. 3(3-0) F,S.* Systematic study of chemical reaction equilibria and phase equilibrium. Use of fugacity, activity and chemical potential concepts for predicting the effect of such variables as temperature, pressure on equilibrium compositions. Methods for measuring and estimating thermodynamic properties important to equilibrium calculation in real systems.

CHE (MAT) 325 Introduction to Polymeric Materials. *Preq: CH 107, MAT 301; Coreq: MAT 324. 4(4-0) F.* Fundamental concepts in polymer science and engineering including: polymer chemistry, synthesis, physical structure, morphology, structure-property relationships, mechanical and thermal behavior, processing, and applications.

CHE 330 Chemical Engineering Lab I. *Preq: CHE 225, CHE 311. 2(0-4) F,S.* Laboratory experiments in unit operations of heat transfer and fluid flow. Experimental planning and technical report writing are emphasized.

CHE 331 Chemical Engineering Lab II. *Preq: CHE 312, CHE 330. 2(0-4) F,S.* Laboratory experiments in mass transfer and reaction kinetics. Experimental planning, technical report writing and oral presentations are emphasized.

CHE 421 Design and Analysis of Unit Operations. *Preq: CHE 312. 3(3-0) F,S.* Procedures for sizing unit operations commonly encountered in the chemical process industries. Operating characteristics, troubleshooting techniques and economic factors in sizing and setting operating variables of these types of equipment will be discussed.

CHE 425 Process System Analysis and Control. *Preq: CHE 225. 3(3-0) S.* Dynamic analysis and continuous control of chemical engineering processes. Process modeling; stability analysis, design and selection of control schemes. Solution of differential equations using Laplace transform techniques.

CHE 446 Design and Analysis of Chemical Reactors. *Preq: CHE 315, Coreq: CHE 316. 3(3-0) F,S.* Characterization and measurement of the rates of homogeneous and heterogeneous reactions. Design and analysis of chemical reactors.

CHE 450 Chemical Engineering Design I. *Preq: CHE 312. 3(3-0) F,S.* Applications of cost accounting, cost estimation for new equipment, manufacturing cost and measures of profitability. Use of computer simulation design and cost programs. Procedures for sizing unit operations commonly encountered in the chemical process industry. Heuristics for selection of separation processes and heat exchanger network synthesis.

CHE 451 Chemical Engineering Design II. *Preqs: CHE 450, CHE 446. 3(2-2) F,S.* Chemical process design and optimization. The interplay of economic and technical factors in process development, site selection, project design, and production management. Comprehensive design problems.

CHE (BAE) 465 Introduction to Biomedical Engineering. *Preqs: MA 202 or MA 212, PY 208 or PY 212. 3(3-0) S.* An introduction to certain engineering concepts and to their quantitative application to biomedical problems, such as flow in the cardiovascular and respiratory systems, transfer of materials through physiological tissues and membranes, and performance of organ replacement and assist devices.

CHE 495 Seminar in Chemical Engineering. *Coreq: Senior standing. 1(1-0) F,S.* Professional aspects and topics of current interest.

CHE 497 Chemical Engineering Projects I. *Preqs: Senior standing. 3(0-12) F,S,Sum.* Introduction to chemical engineering research through experimental, theoretical and literature studies. Oral and written presentation of reports.

CHE 498 Chemical Engineering Projects II. *Preqs: Senior standing. 1-3 (0-variable 3-12) F,S,Sum.* Projects in research, design or development in various areas of chemical engineering.

Selected 500-Level Courses Open To Advanced Undergraduates

CHE 511 Chemical Engineering Process Modeling. *Preqs: CHE 311, CHE 327, MA 341. 3(3-0) F.*

CHE 513 Thermodynamics I. *Preq: CHE 316. 3(3-0) F.*

CHE 515 Transport Phenomena. *Preq: CHE 311. 3(3-0) F.*

CHE 517 Chemical Reaction Engineering. *Preq: CHE 446. 3(3-0) S.*

CHE 521 Separation Processes. *Preq: CHE 312. 3(3-0) S.*

CHE 525 Chemical Process Control. *Preq: CHE 425. 3(3-0) S.*

CHE (OR) 527 Optimization of Engineering Processes. *Preqs: CHE 451 or OR 501, FORTRAN programming. 3(3-0) F.*

CHE 543 Technology of Polymers. *Preq: CHE 325. 3(3-0) S.*

CHE 551 Biochemical Engineering. *Preqs: CHE 312, 446. 3(3-0).*

CHE (TC) 569 Polymers, Surfactants and Colloidal Materials. *Preqs: CHE 316, CH 223. 3(3-0) F.*

CHE (TC) 570 Radiation Chemistry and Technology of Polymeric Systems. *Preqs: CH 221, 431. 3(3-0) S.*

COMMUNICATION

COM (SP) 101 Speech Improvement. *Not accepted for credit toward Communication major. 3(3-0) F,S.* Basic processes of speech production. Attention to the student's voice quality, articulation, pronunciation, and general vocal expression. Speech improvement; help in recognition and reduction of excessive regional dialect.

COM (SP) 103 Introduction to the Theatre. *3(3-0) F,S,Sum.* Artistic, technical, historical, and literary areas of theatre, including acting, directing, design, stagecraft, lighting, costuming, makeup, and criticism.

COM (SP) 110 Public Speaking. *3(3-0) F,S,Sum.* Research skills, topic selection, speech organization, skills in speech delivery. Listening for analysis and evaluation of in-class speech presentation.

COM (SP) 112 Interpersonal Communication. *3(3-0) F,S,Sum.* Interpersonal communication competence: self-concept, self-disclosure, active listening, verbal and nonverbal communication, conflict management, and communication change. ANDERSON

COM (SP) 146 Business and Professional Communication. *Communication majors may not count COM (SP) 146 in the major. 3(3-0) F,S.* The nature of communication theory and practice in business and professional settings. Development of individual, dyadic, group and organizational communication proficiencies. Supervisory/subordinate and peer communication, active listening, group communication, and presentational speaking.

COM (SP) 190 Introduction to Communication. *Communication majors only. 2(2-0) F,S.* Introduction for majors to the discipline of Communication and the five concentrations: communication, mass communication, public relations, communication disorders, and theatre.

COM (SP) 200 Introduction to Communication Inquiry. *Preq: SP 190. 3(3-0) F,S,Sum.* Acquaints speech-communication majors with basic methods and procedures for communication inquiry and the reporting of communication research. Topics include how and why communication scholars ask questions, kinds of approaches to answering questions, and opportunities for utilizing research facilities. Emphasis is given to proper organization and style for writing research papers in communication.

COM (SP) 201 Persuasion Theory. *3(3-0) F,S.* Impacts of persuasive communication on attitudes and behavior. Uses humanistic and social scientific theories to explain the persuasive process. CAMP, RODGERS

COM (SP) 202 Group Communication. *3(3-0) F,S.* Group communication in business, industry, government, and education. Elements of decision-making, leadership, managing conflict, and facilitating productive membership.

COM (SP) 203 Theory and Practice of Acting. *3(3-0) F,S,Sum.* Basic contemporary theories on acting, with practical application through classroom exercises. Role analysis, adaptation of voice and body to performance demands, and role development through various rehearsal activities. CAPLE, RUSSELL

COM (SP) 204 Writing for the Electronic Media. *3(3-0) F,S.* Theory and practice of writing for radio, television and film. Students develop scripts, treatments and storyboards. Areas of study include instructional, dramatic, promotional, and documentary approaches. ALCHEDIAK, KAUFMAN

COM (SP) 211 Argumentation and Advocacy. *3(3-0) F,S.* A study of the process of influencing opinion through the use of logical arguments. Emphasis upon analysis, briefing, evidence, reasoning, and refutation. In-class debating. CAMP

COM (SP) 212 Interracial Communication. *Preq: CI. 3(3-0) F.* Human communication in interracial contexts, with special emphasis on African-American and white American communication. Self awareness and self disclosure of racial attitudes and behaviors. Individual and group exercises and presentations. HANKINS

COM (SP) 213 Oral Interpretation of Literature. *3(3-0) F,S.* Selection, preparation, and oral performance of literature for specific audiences of adults and children. FRANKLIN, SNOW

COM (SP) 214 Introduction to Audio Production. *Preq: COM (SP) 204. Preference is given to Communication majors. 3(1-4) F,S,Sum.* Basic principles of audio production, including studio operation, performing, writing, and producing. BAKER

COM (SP) 215 Introduction To Communication Disorders. *3(3-0) F,S.* Normal speech/language development including the anatomical and physiological bases for reception and expression of oral language. Developmental and acquired speech/language problems and basic treatment principles applied to communication disorders. DEJOY

COM (SP) 223 Stagecraft. *3(3-0) F,S.* Fundamentals of scenery design, set construction, and related technical activities. Practical applications with use of design media and shop facilities. Required production participation in University Theatre presentations.

COM (SP) 224 Introduction to Television Production. *Preq: COM (SP) 204. Enrollment preference is given to Communication majors. 3(1-4) F,S.* Basic techniques of television studio production, including producing, writing, and directing.
ALCHEDIAK, KAUFMAN

COM (SP) 226 Introduction to Public Relations. *3(3-0) F,S.* Public relations as a communication function of organizations. Public relations process, principles, history, and practice. Analysis of environmental, organizational, communication, and audience influences on public relations practice; career opportunities. LONG, PANDICH

COM (SP) 233 Introduction to Stage Lighting. *3(2-2) F.* Fundamentals and uses of stage lighting equipment and stage lighting design. Practical application of design media and shop facilities. Participation in production activity for University Theatre presentations.

COM (SP) 234 Criticism of Entertainment Media. *3(3-0) F.* Examines the history and impact of media entertainment programming. Television is the central focus but film, radio and print are included. Provides awareness of the evolution of contemporary entertainments and skills of isolating and assessing impact. SCHRAG

COM (SP) 243 African-American Theatre. *3(3-0) S.* African-American dramaturgy and its impact on the American theatre; plays from the nineteenth century to the present.
CAPLE

COM (SP) 244 Introduction to Film Production. *3(2-2) F.* Principles of production and editing techniques for 8mm and 16mm film including film stocks, cinematography, camera and lens operation, editing and splicing, the laboratory, scripting, and the film business. Students will script, shoot, and edit short films. ALCHEDIAK

COM (SP) 284 Introduction to Mass Communication. *3(3-0) F.* Development, structure, and functions of radio, television, film, books, newspapers, magazines and other mass media in the United States. Fundamentals of news, mass entertainment, advertising, public relations and mass communication research. SCHRAG, FUNKHOUSER

COM (SP) 293 Theatre Practicum. *1-6 (variable) F,S,Sum.* Practical experience in one or more of the various areas of artistic and technical theatre through active participation in Thompson Theatre's play production program. CAPLE, RUSSELL

COM (SP) 298 Special Projects in Communication. *1-3 F,S.* A special projects course to be utilized for guided research or experimental classes at the sophomore level, topic determined by instructor.

COM (SP) 301 Presentational Speaking. *Preqs: COM (SP) 110 or COM (SP) 146. 3(3-0) F,S.* Design, organization and delivery of oral presentations for policy determination, policy implementation, and sales. GALLAGHER

COM (SP) 302 Managing Meetings. *3(3-0) F.* Rules and customs of meetings in committees, assemblies and organizations; meeting management and group leadership; parliamentary motions and strategies. CAMP

COM (SP) 303 Stage Directing. *3(3-0) S.* Basic theory of directing and its application to theatrical production. Play reading, evaluation, casting procedure, staff organization, and rehearsal planning and practices. Laboratory productions of short plays.
CAPLE, RUSSELL

COM (SP) 312 Patterns of Miscommunication. *3(3-0) F,S.* Miscommunication patterns originating from fallacious semantic assumptions held by communicators. Suggestions for preventing miscommunication. MUNN

COM (SP) 313 Advanced Oral Interpretation. *Preq: COM (SP) 213. 3(1-4) S. Alt. yrs.* Increases skills in selection, preparation, and oral presentation of literature for specific audiences of local elementary and/or secondary school pupils. SNOW

COM (SP) 314 Advanced Audio Production. *Preq: COM (SP) 214. Enrollment preference to Communication majors. 3(1-4) S.* Advanced multichannel techniques for audio production. Studio acoustics, audio signal processing, and advanced microphone techniques, writing, and performing. ALCHEDIAK

COM (SP) 315 Phonetics. *3(3-0) S.* Articulatory and acoustic phonetics; application of the International Phonetic Alphabet with vocal and ear training. FRANKLIN

COM (SP) 321 Survey of Rhetorical Theory. *Preq: COM (SP) 110. 3(3-0) F. Alt. Yrs.* Examines the development of rhetorical theory from classical to modern periods. Emphasis on key concepts of rhetoric and their changes. CAMP, GALLAGHER, RODGERS

COM (SP) 322 Nonverbal Communication. *Preq: COM (SP) 112. 3(3-0) F,S.* Theory and research in nonverbal communication, including: environment; space; physical appearance; movement; eyes and facial expressions; and vocal cues. Nonverbal communication in personal, workplace and cross-cultural setting. ANDERSON, IVY

COM (SP) 323 Introduction to Scenic Design. *Preq: COM (SP) 103 or 223. 3(2-2) S Alt. yrs.* Aesthetics, elements, and principles of scenic design. Theories and applications to the physical stage in relation to the script. Practical applications with the use of design media in University Theatre productions.

COM (SP) 324 Advanced Television Production. *Preq: COM (SP) 224. 3(1-4) S.* Television program production utilizing advanced production techniques. Emphasis on refinement of writing, producing, and directing skills through work in TV studio on production of sophisticated program formats. ALCHEDIAK, KAUFMAN

COM (SP) 325 Anatomy and Physiology of Speech. *3(3-0) F.* Anatomy and physiology of the speech mechanism including the muscular, skeletal, and nervous system structures involved in respiration, phonation, and articulation. DeJOY

COM (SP) 326 Public Relations Applications. *Preq: COM (SP) 226. 3(3-0) F,S.* Management of the public relations function in organizations and public relations counseling; communication theory and nature of materials emanating from public relations departments and counseling firms; practical analysis and development of public relations publicity and campaigns. LONG, PANDICH

COM (SP) 332 Relational Communication. *Preq: COM (SP) 112. 3(3-0) F,S.* Communication patterns in the development and deterioration of interpersonal relationships. Functional and dysfunctional communication behaviors in family relationships. ANDERSON, LEONARD

COM (SP) 333 Advanced Acting. *Preq: COM (SP) 203 or demonstrated competence in acting. 3(3-0) S. Alt. yrs.* Advanced methods in role preparation through exercises in concentration, imagination, sensory and emotional recall, and other Stanislavskian techniques. Analyses and critiques of plays and in-class performances.

COM (SP) 334 Criticism of Information Media. *Preq: COM (SP) 234 or junior standing. 3(3-0) S.* History and impact of informational and persuasive telemediated messages. Topics addressed include credibility and motivation in local and national news media, persuasion in political campaigns and social movements, art and artifice in commercials, the infusion of entertainment elements into informational programs. SCHRAG

COM (SP) 335 Language Development. *3(3-0) F. Alt. yrs.* Syntactic, semantic, morphologic, and pragmatic development from birth through adolescence. The influence of cognitive and social development on language development. First language acquisition versus second language learning. DeJOY

COM (SP) 342 Interviewing. *Preq: Junior standing. 3(3-0) F,S.* Theory and practice of effective communication skills applied in various types of professional interviews. In-class interviewing. MUNN

COM (SP) 345 Delayed Speech and Language Development. *Preq: COM (SP) 335. 3(2-2) S.* Study of delayed speech and language development. Focuses on: mental retardation; central nervous system and emotional disorders; hearing loss; speech deprivation; voice; stuttering; and articulation. Requires field observation. DeJOY

COM (SP) 354 Portable Video Production. *Preq: COM (SP) 204. Preference given to Communication Majors. 3(2-2) F,S.* Introduction to principles of field production (EFP) of video taped programs. Students will gain experience in using specialized equipment (ENG) required for portable production activities. Emphasis is placed on pre-production procedures, such as scripting, equipment selection, and organizing. Post-production activities feature editing and/or assembling the finished production.
ALCHEDIAK, KAUFMAN

COM (SP) 355 Clinical Observation in Speech-Language Pathologies. *Preq: COM (SP) 215; Coreq: COM (SP) 315 or COM (SP) 325. 3(2-3) F,S.* Observation of a variety of therapy techniques and clinical procedures used in the treatment of speech-, language-, and hearing-impaired individuals in the NCSU Speech Clinic and other local internship sites. Several different observation systems will be employed, and observations will be recorded by students on micro-computers. DeJOY, ELLEMAN

COM (SP) 364 History of Film to 1940. *Preq: Junior standing. 3(3-0) F.* Technological developments and aesthetic movements that shaped cinema production and direction from the beginning of the industry to 1940. Evolution in camera movement, editing, sound, storyline, and the documentary. Rise to prominence of the Hollywood studio systems and the contributions of foreign filmmakers. ALCHEDIAK

COM (SP) 374 History of Film From 1940. *Preq: Junior standing. 3(3-0) S.* Technological developments and aesthetic movements that have shaped cinema production and direction from 1940 to the present. Evolution in camera movement, editing, sound, storyline, and the documentary. Post-war decline and re-emergence of the Hollywood film industry and the contributions of foreign filmmakers. ALCHEDIAK

COM (SP) 390 Seminar in Communication. *Preq: 15 hours of COM (SP) courses, Communication majors only. 1(1-0) F,S.* Examination of postgraduate plans for employment or graduate school. Development of coursework and internship plans for senior year.

COM (ANT, HSS, SP) 392 International and Crosscultural Communications. *3(3-0) S.* Patterns and problems of verbal and non-verbal forms of crosscultural communication. Avoidance and management of cultural conflict arising from awareness of characteristics of crosscultural communication. Impact on communication of differing cultural perspectives.

COM (SP) 404 Advanced Studies in Telecommunication. *Preq: COM (SP) 304. 3(3-0) S.* Case studies of issues related to the structure, control and social effects of the telecommunication industry in the United States. FUNKHOUSER, SCHRAG

COM (SP) 411 Rhetorical Criticism. *3(3-0) S.* Rhetorical analysis of public speeches, social movements, political campaigns, popular music, advertising, and religious communication. Neo-Aristotelian criticism, movement studies, genre criticism, dramatistic analysis, content analysis, fantasy theme analysis. CAMP, GALLAGHER, RODGERS

COM (SP) 421 Communication Law. *Preq: Junior standing. 3(3-0) S.* Explores the historical, philosophical, and legal foundations of communication rights and responsibilities. Philosophies and regulations affecting sources, messages, channels, receivers, and situations provide the central focus of the course. RODGERS

COM (SP) 431 Communication in the Political Campaign. *Preq: COM (SP) 110. 3(3-0) F. Alt. yrs.* Examines the critical, situational, and managerial aspects of communication in the contemporary political campaign. CAMP, RODGERS

COM (SP) 446 Problems in Public Relations. *Preq: COM (SP) 226. 3(3-0) F,S.* Theoretic and pragmatic analysis of case studies in public relations practice; current theoretic, cultural, moral, ethical, legal, and pragmatic issues in practice and research.
JAVIDI, LONG

COM (SP) 454 Portable Video Practicum. *Preq: COM (SP) 354. 3(0-6) S.* Hands-on experience in small video-systems production. Students produce instructional videotapes. Provides practical experience in all phases of the production process, including pre-production planning, post-production organization, and critical analysis of the final product. ALCHEDIAK, KAUFMAN

COM (SP) 455 Clinical Practicum in Speech-Language Pathologies. *Preq: COM (SP) 355. 3(2-2) F,S.* Applies theoretical principles through actual treatment of speech, language, and hearing impaired individuals. Licensed Speech-Language Pathologists on staff in the NCSU Speech Clinic supervise treatment provided by students. DeJOY, ELLEMAN

COM (SP) 456 Organizational Communication. *Preqs: COM (SP) 110 or COM (SP) 112, or Jr. standing. 3(3-0) F,S,Sum.* Role of human communication in organizations, the assumptions inherent in management philosophies about effective communication, and an investigation of the relationships among communication, job satisfaction, productivity, development, and employee motivation. JAVIDI, LONG

COM (SP) 465 Advanced Clinical Practicum in Speech-Language Pathologies. *Preq: A grade of C or better in COM (SP) 455, COM (SP) 335, COM (SP) 345. 3(2-2) F,S.* Applies theoretical knowledge with practical application for speech, language and hearing impaired individuals. Appraisal and treatment provided by students is under the direct supervision of licensed Speech-Language Pathologists on staff in the NCSU Speech Clinic. DeJOY, ELLEMAN

COM (SP) 474 Video in Business and Industry. *Preq: COM (SP) 224 or COM (SP) 354. 3(3-0) S.* Planning and controlling the use of video for training, employee communication, public relations, and other purposes in organizations. Applications, organizational variables, and technologies. ALCHEDIAK, KAUFMAN

COM (SP) 496 Communication Internship. *Preq: Jr. standing in Communication; permission of Department. Communication majors only. 3(1-10) F,S.* Directed work of experience for Communication majors with supervision from the work site and the University. ANDERSON

COM (SP) 498 Special Topics in Communication. *Preq: Nine hours of speech, junior standing and permission of the department. 1-3 F,S.* A detailed investigation of a special topic in the communication arts or sciences.

COMPARATIVE LITERATURE

CL 495 Special Topics in Comparative Literature. *3(3-0) S.* Detailed investigation of a topic in comparative literature. Topic and mode of study determined by faculty member(s) in consultation with Comparative Literature Committee and heads of departments of English and Foreign Languages.

CROP SCIENCE

CS 211 An Introduction to the Crop Plant. *Preq: BS 100 or BO 200. 2(4-0) F,S.* Fundamental morphological, physiological and reproductive features of crop plants are discussed. First of a sequence of two half semester minicourses which may be taken in the same semester. FIKE

CS 212 Introduction to Crop Management. *Preq: CS 211. 2(4-0) F,S.* Introduction to the management practices used for the economical production of field crops in North Carolina. Second of a sequence of two half semester minicourses which may be taken in the same semester. FIKE

CS 214 Crop Science Laboratory. *Preq. or Coreq: Any Crop Science course. 1(0-2) F,S.* Evaluates methods of identifying crop seeds and plants. Deals with the problems of buying, evaluating, treating, and producing quality crop seeds. Includes field trips to experiment stations, Crops Garden, campus laboratories, and State Seed Testing facilities. Coverage varies from semester to semester according to season of year and current production problems. FIKE

CS 295 Special Topics in Crop Science. *Preq: CS 211, CS 212, or BO 200. 1-6 F,S,Sum.* Individual study of specific crop science principles or production practices. Also present topics of current interest. DiPAOLA

CS 312 Pastures and Forage Crop. *Preqs: BS 100, SSC 200 recommended. 3(3-0) S.* Production and preservation of the principal forage crops, with attention to the establishment and maintenance of pastures. CHAMBLEE

CS 315 Turf Management. *Preq: BS 100. 3(2-2) S.* Production, utilization, and management of turf grasses. Growth responses of different plant species to natural and imposed environmental factors are assessed. Interrelationships of climate, soil, biotic factors, and plants are examined in the field, laboratory, and classroom. DIPAOLA

CS 318 Corn and Soybean Production. *Preq: CS 211, CS 212, SSC 200. 3(3-0) F., Alt. yrs.* Principles of corn and soybean management in southeastern U.S.A., including cultivar selection, planting, pest management, nutritional requirements, tillage and soil management, water management, harvesting, marketing and utilization.

CS 411 Environmental Aspects of Crop Production. *Preq: BO 421. 2(2-0) F.* The productivity and quality of crops in relation to all environmental factors, including man. Disorders caused by physical and biotic environmental stresses and the role of these environmental factors in normal crop development are emphasized. Utilization and manipulation of the environment for the continued improvement of crops are discussed. PATTERSON

CS 413 Plant Breeding. *Preq: GN 411. 2(2-0) S.* Discussion of reproductive systems of higher plants; the genetic basis for plant improvement and the selection, evaluation, and utilization of crop varieties.

CS 414 Weed Science. *Preq: CH 220. 4(3-2) F.* History, current status and fundamentals of weed biology and cultural, biological, and chemical weed control; properties and uses of herbicides; weed identification; proper use of herbicides and herbicide application equipment; and current weed management practices in crops and non-cropland situations. WORSHAM

CS (SSC) 462 Soil-Crop Management Systems. *Preqs: CS 212, CS 414, SSC 342, SSC 452, senior standing. 3(2-3) S.* (See Soil Science). FIKE

CS 490 Senior Seminar in Crop Science. *Preq: Senior in Agronomy. 1(1-0) S.* Collection, organization, written preparation, and oral delivery of scientific information in crop science and related fields. DiPAOLA

CS 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

CS 493 Special Problems in Crop Science. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer the departmental teaching coordinator and the academic dean prior to the experience.

CS 495 Special Topics in Crop Science. *1-3 F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

Selected 500-Level Courses Open To Advanced Undergraduates

CS 511 Tobacco Technology. *Preq: BO 421 or equivalent. 3(3-0) S.*

CS 513 Physiological Aspects of Crop Production. *Preq: BO 421. 3(3-0) S. Alt. yrs.*

CS 591 Special Problems. *Preq: CI. Credits Arranged. F,S,Sum.*

COMPUTER SCIENCE

CSC 100 Computer Literacy. *Credit for CSC 100 is not allowed if student has prior credit in any other computer science course or computer related course. Offered only through Independent study by Extension. 2(2-0).* Survey of electronic data processing, computer hardware and software systems, and developments in information processing. Comprehensive overview of the computer: what it is, what it can and cannot do, how it operates, how it may be instructed to solve problems. Introduces both terminology and applications.

HONEYCUTT

CSC 101 Introduction to Programming. *Preq: MA 111 with a grade of C or better. 3(2-2)* Understanding algorithms, programs, computer organization and characteristics of computers. Fundamental algorithms associated with computing. Data representation. Introductory programming and program structure. Debugging and verification of programs. Computer solutions of numerical and non-numerical problems using a higher-level programming language.

CSC 102 Programming Concepts. *Preq: CSC 101 (with Pascal) or CSC 110. 3(3-0)* An introduction to modern techniques for systematic problem analysis and program design, testing, debugging, and documentation. Management of larger projects and use of more advanced algorithms than in CSC 101. Projects and algorithms from non-numeric and data-processing applications.

CSC 110 Introduction to Computing—Pascal. *Preq: E 115, MA 141. Students taking this course must be eligible to use COE computing equipment. 3(2-3) F,S.* Algorithm development and problem solving in Pascal. Particular elements include: careful and methodical development of Pascal programs from specifications; documentation and style; appropriate use of control structures, data types and subprograms; abstraction and verification; numeric and nonnumeric applications.

CSC 111 Introduction to FORTRAN Programming. *2(2-0)* An introductory FORTRAN programming course for non-majors. Emphasis is on fundamental elements of problem-solving using the computer. Particular elements include: careful systematic development of algorithms; translation of algorithms into programs written in FORTRAN; documentation of programs, debugging, and testing; facilities of modern computer systems.

CSC 112 Introduction to Computing—FORTRAN. *Preq: E 115, MA 141. Students taking this course must be eligible to use COE computing equipment. 3(2-3) F,S.* Problem solving through writing FORTRAN programs. Particular elements include: careful development of FORTRAN programs from specifications; documentation and style; appropriate use of control structures, data types and subprograms; abstractions and vertification; engineering applications.

CSC 200 Introduction to Computers and Their Uses. *May not be used by CSC major as a restricted elective. 3(2-2) F,S,Sum.* Computer history, hardware, systems analysis, security and legal issues. Software, including desirable characteristics of programs, the programming process, writing programs, and using a spreadsheet program.

CSC 201 Basic Computer Organization and Assembly Language. *Preq: CSC 102 or CSC 210. 3(3-0) F,S,Sum.* History of computing. Number systems, von Neuman machines,

instruction sets and machine code, data representation, assemblers and assembly language programming, compilers, external and internal processor organization, memory, I/O organization and devices, and simple multi-processors. Detailed study of a contemporary processor.

CSC 202 Concepts and Facilities of Operating Systems. *Preq: Assembler Language. 3(3-0) F,S.* History and development of operating systems. Primary components and services of contemporary multi-processing systems; file systems, memory and process management, scheduling policies, virtual resources, terminal interface, command languages, linking and loading, program execution, event-driven kernel, device drivers, system performance, concurrency control, distributed systems. Detailed study and use of a contemporary system.

CSC (MA) 222 Applied Discrete Mathematics. *Preq: CSC 101, MA 141. 3(3-0) F,S.* Formal logic. Methods of proof including induction. Introduction to grammars and finite state machines. Recurrence relations and asymptotic behavior of functions. Sets and counting. Boolean expressions and logic networks. Graphs and relations.

CSC 252 Principles of Programming—COBOL. *Preq: CSC 101 or CSC 110. 2(2-0) F,S,Sum.* Introduction to the business-oriented programming language Cobol. Programming assignments cover general data processing, file maintenance and report generation.

CSC 254 Principles of Programming—APL. *Preq: MA 405. 1(1-0).* Advanced programming concepts in APL and their application to a wide variety of computing problems. The APL reference language and locally available APL hardware representations.

CSC 255 Principles of Programming—Snobol. *1(1-0).* Syntax and semantics of the symbol manipulation language Snobol 4. Applications of the language to programming problems in non-numeric areas.

CSC 295 Special Topics in Computer Science. *1-3.* Special topics in CSC at the early undergraduate level.

CSC 302 Introduction to Numerical Methods. *Preqs: CSC 101, or CSC 110 or CSC 112, MA 242. 3(3-0) F,S.* Numerical computations with digital computers; floating point arithmetic and implications of round-off error. Algorithms and computer techniques for the numerical solution of problems in: function evaluation; zeros of functions; interpolation; numerical differentiation and integration; linear systems of equations; curve fitting; solutions of non-linear equations; numerical solutions of ordinary differential equations.

CSC 311 Data Structures. *Preq: CSC 102 or CSC 210. 3(3-0) F,S,Sum.* Fundamental algorithms associated with data structures. Topics include the sequential and linked allocation of linear lists, stacks, queues, circular lists, arrays, orthogonal lists, strings and trees. Binary trees and their transversal, double-linked lists and multilinked structures, generalized lists, garbage collection and dynamic storage allocation are also considered. The notion of computational complexity is introduced.

CSC 312 Computer Organization and Logic. *Preqs: CSC 201, Coreq: CSC 222. 4(3-2) F,S.* Combinational logic circuits and their relation to Boolean algebra. Functional properties of combinational and sequential components and their realizations in integrated circuit forms. Organization of digital computer components; processors, control units, memories, switches, and peripherals. Architecture of computer systems. Computer arithmetic. Microprogrammed control. Interrupt mechanisms. Laboratory exercises involve logical, functional, and electrical properties of components from gates to microprocessors.

CSC 412 Introduction to Computability, Languages and Automata. *Preq: CSC 222. 3(3-0) F,S.* An integrated development of the main results in the three areas of machines, languages, and computability. Chomsky's hierarchy of grammars and the automata that recognize the languages they generate. Major emphasis on finite-state automata and Turing machines; the problems they can solve and their limitations. Equivalence of Turing machines and recursive functions.

CSC (MA) 416 Introduction to Combinatorics. *Preqs: MA 242 and proficiency in a programming language. 3(3-0). S Alt. yrs.* 2(See Mathematics).

CSC 417 Theory of Programming Languages. *Preq: CSC 222. 3(3-0) F,S.* Theory of design and implementation of programming languages. Topics include the definition, translation, and structure of programming languages. Formal languages and automata are introduced and their applications to language definition and translation are presented. The design and implementation of language features are discussed and existing programming languages are compared.

CSC 421 Introduction to Management Information Systems. *Preq: CSC 311. 3(3-0) F,S.* Introduction to principles and techniques of information analysis and systems design as they relate to the development of management information systems (MIS). Information flow. Information requirements of management. Decision-making models. Operations analysis and modelling techniques. Organizational behavior. Systems design process. Systems analysis tools. Management games.

CSC 422 Management Information Systems. *Preq: CSC 421. 3(3-0) S.* Development of computer-based management information systems. Decision systems. Decision support systems. Interface considerations between management and the information systems. Data base concepts. Planning and programming management information systems. Cost-effectiveness and cost-benefits analysis. Management information systems project.

CSC 423 Information Resources Management. *Preq: CSC 421. 3(3-0) S.* Information Resources Management is a process that encompasses strategic planning, the implementation of new technology, dramatic changes to both the corporate Management Information Services and traditional information systems architecture, and the emerging role of end user computing to enable a business enterprise to operate effectively.

CSC (MA) 427 Introduction to Numerical Analysis I. *Preqs: MA 301 and programming language proficiency. 3(3-0) F.* Theory and practice of computational procedures using a digital computer, including approximation of functions by interpolating polynomials, numerical differentiation and integration, and solution of ordinary differential equations including both initial value and boundary value problems. Computer applications and techniques.

CSC (MA) 428 Introduction to Numerical Analysis II. *Preqs: MA 405 and programming language proficiency; MA (CSC) 427 is not a prerequisite. 3(3-0) S.* Computational procedures using digital computers. Solution of linear and nonlinear equation, matrices and eigenvalue calculation; curve fitting and function approximation by least squares, smoothing functions, and minimax approximations.

CSC 431 File Organization and Processing. *Preq: CSC 311. 3(3-0) F,S.* File organization and retrieval techniques. Command and query languages. Hardware characteristics of storage media. Basic file organizations including sequential, indexed sequential and direct. Searching techniques. Hashing. Inverted Files. Retrieval with primary and secondary keys. Superimposed coding. Storage structures including B-trees, AVL trees and tries. Introduction to data-base management systems.

CSC 432 Database Management Systems. *Preq: CSC 431. 3(3-0) F.* Introduction to database concepts. Data models: hierarchical, network and relational. Query languages. Query optimization. Database design. Implementation considerations. Concurrency and locking. Data integrity. Distributed databases. Database machines. Use of a commercial database system. A course project will be assigned.

CSC (ECE) 440 Digital Systems Interfacing. *Preq: A grade of C or better in either ECE 218 or CSC 312. 3(2-3) F,S.* Concepts of microcomputer system architecture and application to fundamental computer hardware. Theory and practical experience in digital system interfacing using a variety of microprocessor peripheral chips with specific microprocessor/microcomputer systems. Practical aspects of interfacing real-world devices to a microcomputer system both from hardware and software points of view.

CSC (IE) 441 Introduction to Simulation. *Preqs: MA 242, ST 372, programming proficiency. 3(3-0) F,S.* Techniques and applications of simulation for problem solving, including

random number generation, input data analysis, waiting lines, variance reduction techniques, model verification and validation, and output analysis. Use of a simulation language illustrates approaches for the study of systems. Problems of interest to scientists and engineers. Programming required.

CSC 451 Operating Systems. *Preq: CSC 202, CSC 311. 3(3-0) F,S.* Functions, structure, history and development of assemblers, macroprocessors, loaders, linkers, editors, interrupt handlers, device drivers, and other operating system components. Processor architecture, input-output devices from a software point-of-view. High level language constructs supporting concurrency in programming. Programing required.

CSC 452 Operating Systems Projects. *Preq: CSC 451; Coreq: ENG 321. This course qualifies as project course required of CSC majors. 3(3-0) F,S.* Definition, design, and implementation of a significant operating system project from such areas as single or multi-user file systems, process management, virtual memory, time-sharing, real-time control. Programming required.

CSC 461 Computer Graphics. *Preqs: MA 242 or MA 212; CSC 101 or CSC 110 or CSC 112. 3(3-0) F.* Principles of computer graphics with emphasis on two-dimensional raster graphics. Topics include: graphics hardware and software, line and polygon drawing algorithms, transformations, segments, windowing and clipping, and interaction techniques. Core Graphics Standard followed for algorithm implementation. Programming required.

CSC 462 Computer Graphics Projects. *Preq: CSC 461; Coreq: MA 305. This course qualifies as project course required of CSC majors. 3(3-0) S.* Principles of computer graphics with emphasis on three-dimensional raster graphics. Topics include: transformations, projections, windowing and clipping, hidden lines and surfaces, shading, and curved surface representation. Core Graphics Standard followed for algorithm implementation. Programming required.

CSC 471 Programming Environments. *Preqs: CSC 202, CSC 311. 3(3-0) F.* Software systems for intensive programming. Support tools, prototyping, instrumentation, layering, subsystem organization, programmer coordination, documentation and configuration control will be illustrated on UNIX, which will be examined in detail: C language, libraries, system calls, file system, the Shell, and major utilities. Comparative survey of other contemporary environments.

CSC 472 Software Engineering Project. *Preq: CSC 471. Coreq: ENG 321. Audits not allowed. 3(3-0) S.* Development of a complex application subsystem following software engineering methods: requirements analysis, design, documentation quality assurance, configuration control, work and time management. Introduce distinction of development and target environments. Term project required. Additional topics dependent upon application.

CSC 481 Software Engineering with Ada. *Preq: CSC 311. 3(3-0).* Theory and practice in the high order language Ada, with emphasis on software engineering issues addressed by the language. Language applications and techniques.

CSC 495 Special Topics in Computer Science. *Preq: CI. 1-6 F,S,Sum.* Used for the following types of study: readings in the literature of computer science, introductory research projects, major computer programming projects, seminars, or new course development. Work may be done in any CSC area such as software, hardware utilization, programming languages, numerical methods or telecommunications.

CSC 499 Independent Research in Computer Science. *Preq: Consent of Department. 1-6 F,S,Sum.* Independent investigation of a research problem under faculty supervision.

Selected 500-Level Courses Open To Advanced Undergraduates

CSC (ECE) 501 Design of Systems Programs. *Preqs: CSC 201, CSC 311 and MA 421. 3(3-0) F,S.*

CSC (ECE) 506 Digital Systems Architecture. *Preq: ECE 340 or CSC 312. 3(3-0) F,S.*

CSC (ECE) 510 Software Engineering. *Preqs: CSC 311 and CSC 322. 3(3-0) F.*

CSC (ECE) 512 Compiler Construction. *Preq: CSC 311. 3(3-0) S.*

CSC 541 Advanced Data Structures. *Preq: CSC 311. 3(3-0) F.*

CSC (ECE) 542 Database Management. *Preq: CSC 431 or CSC (ECE) 501. 3(3-0) F.*

CSC (ECE) 571 Data Transmission/Communications. *Preqs: CSC 312 or ECE 301. 3(3-0) S.*

CSC (ECE) 572 Computer Communications. *Preq: CSC 312 or ECE 340; Coreq: B average in technical subjects. 3(3-0) F.*

CSC (ECE) 573 Introduction to Computer Performance Modelling. *Preqs: MA 421; Coreq: CSC 501. 3(3-0) F.*

CSC (ECE) 574 Real Time Computer Systems. *Preq: CSC 405 CSC (ECE) 501. 3(3-0) Alt. S.*

CSC (MA) 583 Numerical Solution of Ordinary Differential Equations. *Preq: MA 512. 3(3-0) S.*

CSC (MA) 584 Numerical Solution of Partial Differential Equations—Finite Difference Methods. *Preq: Knowledge to the level of CSC 427-428. 3(3-0) F,S.*

CSC (MA, OR) 585 Graph Theory. *Preq: MA 405. 3(3-0) F.*

DESIGN FUNDAMENTALS

(Also see DN—Design.)

DF 101 Design Fundamentals Studio I. *School of Design students only or written approval of department head and dean. 6(0-11) F.* Introduction to the design disciplines and departments of the School of Design. A studio course examining the techniques and attitudes for dealing with identification, solution and evaluation of problems arising from the design of physical artifacts in the natural and built environment. The design studio process includes the acquisition of languages and skills appropriate to design studies.

DF 102 Design Fundamentals Studio II. *Preq: DF 101 or written approval of department head and dean. 6(0-9) S.* Second course—design disciplines and departments of the School of Design. Examines the techniques and attitudes for dealing with identification, solution, and evaluation of problems arising from the design of physical artifacts in natural and built environments. Acquisition of languages and skills appropriate to design studies.

DF 111 Two Dimensional Design for Non-Design Majors. *This course is not open to School of Design students. 3(0-6) F,S.* An introduction to the fundamentals of design studies through two dimensional problems. The basic elements and concepts of design will be explored as abstract and applied problems through design issues. It is the goal of this course to provide non-design students an introduction to design principles and a language of design.

DF 112 Three Dimensional Design for Non-Design Majors. *This course is not open to School of Design students. 3(0-6) F,S.* An introduction to the fundamentals of design studies through three dimensional problems. The basic elements and concepts of design will be explored as abstract and applied problems through the design issue. It is the goal of this course to provide non-design students a working knowledge of design principles and a language of design.

DESIGN

(Also see ARC—Architecture, DF—Design Fundamentals, LAR—Landscape Architecture, PD—Product Design, and VD—Visual Design.)

DN 140 Experiencing Architecture. *Open to any design student, except Architecture majors. 3(3-0) F. For non-architecture majors.* Contemporary and historic houses, public buildings and cities illustrate the practical and aesthetic aspects of architecture. The basic elements of architectural form, design process, and architectural criticism. HARMON

DN 141 History of Design I. *3(3-0) F.* Western design from prehistory to Imperial Rome through examples of architecture and construction, landscape and urban planning, pure and applied three- and two-dimensional artifacts in their cultural setting. Students draw and/or construct selected historical design solutions. REUER

DN 142 History of Design II. *3(3-0) S.* Western design from the early Christian to the Modern Age through examples of architecture and construction, landscape and urban planning, pure and applied three- and two-dimensional artifacts in their cultural setting. Students draw and/or construct selected historical design solutions. REUER

DN 165 Microcomputers for Designers. *School of Design majors only. 3(3-0) F,S.* Microcomputers and introductory programming with specific applications to design. TECTOR

DN 212 Basic Photography. *Preq: DF 102. 3(2-2) F,S.* Introduction to the processes and visual skills necessary for the beginning photographer. Darkroom experimentation, pinhole camera, basic rudiments of camera use, film development and printing. Exploration of issues related to the quality of visual communication.

DN 221 Introduction to Environment and Behavior for Designers. *3(3-0) F.* Integration of behavioral and environmental systems related to design. Exploration of humane, ecologically sound design alternatives. WOOD

DN 222 Perception and Behavior for Designers. *3(3-0) S.* Perceptual systems, linkages among them, and linkages between them and language and culture as these affect the design process. WOOD

DN (TAM) 272 Printed Textile Design. *A grade of C or better in DF 101 or DF 111. 3(3-0)F,S.* Design and production of printed and pattern-dyed fabrics. Development of design abilities through hand production methods with an awareness of industrial processes. WILCHINS

DN 273 Materials and Processes in Fibers and Surface Design. *Preq: DF 101 or DF 111 or DF 112. 3(0-6) F,S.* Introduction to historical and contemporary hand processes used by the textile designer. Students will learn a variety of textile techniques utilizing traditional and experimental methods. Emphasis will be on technical exploration and development.

DN 292 Special Topics in Design *Preq: Consent of Instructor. 1-3. F,S.* Topics of current interest in the School of Design.

DN 311 Basic Visual Laboratories. *Preq: Design Majors: DF 102; Non-Design Majors: DF 111, 112. 3(0-6) F,S.* Continuation on a basic level of the activities encountered in Design Fundamentals that relate to the major design areas in the School of Design. Activities involve study of visual communication skills in areas of sculpture, life drawing, printmaking, painting. The student elects instructor and area(s) of activity.

DN 312 Intermediate Photography. *Preq: DN 212. 3(2-2) F,S.* Continuation on an advanced level of the skills and techniques developed in Basic Photography. Purpose is to develop use of camera as a perceptual tool to increase awareness and sensitivity of visual imagery.

DN 316 Film Animation. *Preqs: DF 102; or DF 111 and 112. 3(3-0) Alt. yrs. S.* A course in experimental film animation with emphasis on the integration of drawing, sculpture, 3-dimensional model building and film making. TOPLIKAR

DN 317 Typography II. *Preq: DN 217. 3(1-4) S.* Continuation on an advanced level of the activities encountered in Typography I. Designed to allow the student to make an in-depth study of communication via typographic means.

DN 354 Building Workshop. *Preq: DF 102. 3(2-2) S.* Gives the student the opportunity to concentrate on the process and logic of building one's own design. The workshop brings together structural behavior, geometry, and materials in the construction of physical form at a large scale. The experience of execution offers the opportunity for evaluative testing with the critical support of a faculty member. TAYLOR

DN 400 Design Studio. *Preq: DF 102 or written approval of department head and dean. Course may be used to partially satisfy studio requirement in all undergraduate degree programs in the School of Design. 6(0-9) F,S.* Studio offering upper level undergraduates the opportunity to intensively study general design issues (form, color, structure, proportions, scale, etc.) in a studio mode. PAUSE, TAYLOR

DN 411 Advanced Visual Laboratory. *Preq: DF 102; or both DF 111 and DF 112. May be taken for a maximum of 12 credit hours by School of Design students. 3(0-6) S.* Visual communication skills in the areas of sculpture, life drawing, painting, illustration, and printmaking. COX, JOYNER

DN 412 Advanced Photography. *Preq: DN 312. 3(2-2) S.* Use of the camera as a communicative vehicle for the expression of ideas and information. The study and manifestation of visual imagery.

DN 413 Synthetic Drawing. *Preq: DF 102 or DF 111; DF 112. 3(2-3) Every 3rd Sem.* Orthographic and axonometric projections, coordinating and perspective systems, and diagramming to facilitate the drawing of shapes and forms conceived by the designer in order to make visually precise simulations of design adeas.

DN 414 Color and Light. *Preq: DF 102. 3(3-0) F,S.* Physical and perceptual nature of color, color awareness, sensitivity and skills in visual communication with color as a designer's tool.

DN 415 Microcomputer Graphics for Designers. *Preq: DN 165. 3(3-0) S.* Theory and development of computer graphic algorithms for microcomputers and applications to the geometries of design. TECTOR

DN 421 Environmental Cognition for Designers. *3(3-0) F.* Basic cognitive theory as a framework for exploration of cognitive imagery; images of self; and developmental images of home, school, neighborhood, and city. WOOD

DN 423 Concepts of Space. *3(3-0) F.* The role of space and its representation in design is considered against an overview of concepts of space drawn from psychology, anthropology, mathematics, art history and philosophy. WOOD

DN 445 Aesthetics and Design. *Preq: Junior standing. 3(3-0) S.* Aesthetic experience in the perception of things, places, and activities of everyday life. Role of aesthetic constructs in the conception and evaluation of designed artifacts. TESAR

DN 454 Geometry for Designers. *Preq: Junior standing. 3(3-0) F.* Geometry and its application to the various fields of design. Mathematical and drawing skills required. TAYLOR

DN 455 Building Workshop. *Preq: DF 102 or both DF 111 and DF 112. 3(2-2) Every 3rd Sem.* Process and logic of producing one's own design. Structural behavior, geometry, and materials in the construction of physical form usually at a large scale. Evaluative testing with critical support.

DN 480 Intermediate Studio. *Preq: DF 101 and DF 102 or DF 111, DF 112 and DN 311F. 6(0-9) F,S.* Studio format offering upper level undergraduates the opportunity to intensively study general design issues (form, color, structure, proportions, scale, etc.) through individual study in drawing, painting, sculpture, photography, or printmaking.

DN 481 Sculpture: Life Modeling. *Preq: DF 101 or DN 411S. 3(0-6) S.* A studio course with direct observation of nature a primary concern. In-depth study of specific modeling concepts and processes.

DN 491 Special Seminar in Design. *1-3 F,S.* Seminars on subjects of current interest in design.

DN 492 Special Topics in Design. *1-3 F,S.* Topics of current interest in the School of Design normally used to develop new courses.

DN 494 Internship in Design. *Preq: Junior standing in Design; 3.0 GPA or better; and approval of department head. 3-6 F,S.* Supervised field experience in design offices and organizations. JOYNER

DN 495 Independent Study in Design. *Preq: Junior standing in Design; 3.0 GPA or better; and approval of department head. 1-3 F,S.* Special projects in design developed under the direction of a faculty member on a tutorial basis. JOYNER

Selected 500-Level Courses Open To Advanced Undergraduates

DN 541 Seminar on Ideas in Design. *Preq: Grad. standing. 2-3 F,S.*

ENGINEERING

E 100 Introduction to Engineering. *0(1-0) F.* Orientation to the University and introduction to the College of Engineering and the engineering profession. General academic requirements and special educational opportunities, the history of engineering and computer science, professionalism and ethics.

E 110-111 Engineering Scholars Forum. *Preq: Enrollment limited to participants in the Engineering Scholars Program. 0(2-0) F,S.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

E 115 Introduction to Computing Environments. *Preq: Students taking this course must be eligible to use COE computing equipment. 1(0-3) F,S.* Introduction to report generation, tabular computations, geometric CAD, and general system usage through the use of engineering workstations.

E 210-211 Engineering Scholars Forum. *Preq: Enrollment limited to participants in the Engineering Scholars Program. 0(2-0) F,S.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

E 432 Patents, Trademarks and Copyrights. *Preq: Jr. standing. 3(3-0) S.* Patent, trademark and copyright problems that arise in engineering, scientific and industrial pursuits. Includes the rights and remedies available to individual inventors and authors as well as companies. Patent Office procedures and practices. MILLS

Selected 500-Level Courses Open To Advanced Undergraduates

E (MA, OR) 531 Dynamical Systems and Multivariable Control. *Preqs: MA 301, 405 or equivalent. 3(3-0) F.*

ADULT AND COMMUNITY COLLEGE EDUCATION

EAC 478 Extension as Non-Formal Education. *Preq: Advanced undergraduate or PBS. 3(3-0)S.* Extension as a system of non-formal education, how it functions in USA and other countries (with special attention to agricultural extension), historical antecedents and philosophical foundations, mission, organization, methods; problems dealt with; how

technology and behavioral sciences are/can be utilized; provides actual experience with Extension and with conceptual/theoretical ideas that undergird practice. Day field trips required. CARTER

AGRICULTURAL AND RESOURCE ECONOMICS

EB 212 Economics of Agriculture. *Preq: MA 111. Credit will not be awarded for both EB 201 and EB 212. 3(3-0) F,S.* Introduction to the functioning of the agricultural economy including the allocation of resources in agricultural production and consumption, relationships between agriculture and other segments of the economy, and current problems within the agricultural sector.

EB 301 Intermediate Microeconomics. *Preqs: MA 113 or 112; EB 201 or 212. Credit not allowed for both EB 301 and 401. 3(3-0) F,S,Sum.* Functioning of the market economy: role of prices in determining the allocation of resources; the functioning of the firm in the economy; forces governing the production of economic goods.

EB 303 Farm Management. *Preq: EB 212 or 201. 3(2-2) F,S.* Analytical and planning techniques applicable to farm business decisions. Economic principles and management concepts such as budgeting, linear programming, accounting and financial management as related to practical problems of organizing and operating a farm business. TOUSSAINT

EB 306 Agricultural Law. *Preq: EB 201 or EB 212. Credit for both EB 306 and EB 307 is not allowed. 3(3-0) F,S.* Legal principles of practical importance in an agricultural setting: the court system; tort, contract and real and personal property law; legal aspects of organizing an agribusiness; environmental and labor regulations affecting agriculture; income and estate taxation of agriculture. RHUDY

EB 311 Agricultural Markets. *Preq: EB 212 or 201. 3(3-0) F,S.* The agricultural marketing system and the current economic forces affecting its structure and efficiency, decision-making by agricultural business firms including integration and interfirm relationships; effects of monopoly in marketing relative to government policies of control. Emphasis on managerial decisions including an examination of the role of futures markets and their use by firms in the agricultural marketing system. THURMAN

EB 401 Economic Analysis for Nonmajors. *Preq: EB 201 or 212. Not open to undergraduates majoring in the Department of Economics and Business. Credit not allowed for both EB 301 and 401. 3(3-0) F,S.* Intermediate economic theory of firm, household, and market behavior primarily for graduate students desiring an economics minor at the master's level. Students who have taken intermediate microeconomics and calculus elect EB 501 instead. Topics include demand, production and cost theory, market equilibrium under competitive and non-competitive conditions, an introduction to general equilibrium theory, externalities and problems of economic efficiency. GRENNES, WALDEN

EB 403 Economics of Consumer Decisions. *Preq: EB 201 or EB 212. Not open to undergraduates majoring in the Department of Economics and Business. 3(3-0) Alt. Sum.* The application of microeconomic and macroeconomic concepts to practical consumer decisions: home ownership and housing finance, credit, insurance, investments, retirement planning, energy considerations and information collection. Relationship of macroeconomic policy decisions to individual consumer decisions. WALDEN

EB 415 Farm Appraisal and Finance. *Preq: EB 303. 3(2-2) F.* The earnings, market and cost approaches to real estate valuation with practice in the application of current appraisal procedures to rural property. Criteria and techniques for the financial management of a farm. Covers existing sources and terms of capital covers, forms of business organization and methods of credit analysis. OLTMANS

EB 430 Agricultural Price Analysis. *Preq: EB 301. 3(3-0) S.* Factors influencing agricultural prices and their effects on producers and consumers; analysis of the interrelationship of cash, futures, and option market prices of agricultural commodities and alternative

ways in which governmental action affects agricultural prices; development of models for price analysis and forecasting construction of price indices, and calculation of parity price. FACKLER

EB 433 U.S. Agricultural Policy. *Preq: EB 301 or EB 401. 3(3-0) S.* Government economic policies and programs affecting agricultural inputs and farm products. Analysis of the rationale, objectives, and major types of agricultural programs and their effects on resource allocation and income distribution within agriculture and between agriculture and the rest of the economy. PASOUR

EB 436 Environmental Economics. *Preq: EB 301. 3(3-0) F,S.* Useful of economics in understanding pollution, congestion, conservation and other environmental problems. Relevant economic tools such as pricing schemes, abatement cost curves, damage functions and benefit-cost analysis. Pollution taxes, regulations and subsidies considered in designing alterations in the incentive system. Public policy alternatives examined in the context of non-market decision making. CARLSON, PALMQUIST, SMITH

EB 490 Senior Seminar in Economics. *Preqs: EB 301, EB 302, EB(ST) 350 and two courses from list of economic electives. 3(3-0) F,S,Sum.* The terminal course for a student majoring in Economics and Business. The undergraduate students are assisted in summarizing their training and in improving their capacity to recognize problems, and to select logically consistent means of solving problems. The seminar is kept small to allow individualized instruction.

EB 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

EB 493 Special Problems/Research Exploration. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

EB 495 Special Topics in Economics and Business. *Preq: Consent of the Department. 1-6.* Presentation of material not normally available in regular course offerings, or offering of new courses on a trial basis.

EB 498 Independent Study in Economics and Business. *Preq: Consent of Department. 1-6. F,S,Sum.* Detailed investigation of topics of particular interest to advanced undergraduates under faculty direction on a tutorial basis. Credits and content determined by faculty member in consultation with Associate Department Head.

BUSINESS MANAGEMENT

EB 307 Business Law I. *Preq: EB 201 or 212. Credit for both EB 306 and EB 307 is not allowed. (3-0) F,S.* The main principles of law affecting the conduct of trade. Main areas of interest: criminal law, tort law, contracts, agency, real and personal property, wills, and estates.

EB 308 Business Law II. *Preq: EB 307. 3(3-0) F,S.* The main principles of law affecting the conduct of trades and industry, including corporations, partnerships, insurance, government regulation of business, sales, negotiable instruments, and selected transactions. CARRAWAY, HUGGARD, PEACE

EB 313 Marketing Methods. *Preq: EB 201 or 212. 3(3-0) F,S.* Examination of decisions affecting marketing of goods and services in consumer, industrial and international markets. Emphasis on the role of marketing in a managerial context. Areas studied

include: the activities of marketing research, identification of marketing opportunities, and the development of marketing mix strategies including the decisions concerning pricing, distribution, promotion and product design. GERSTNER, HESS, TANG

EB 320 Financial Management. *Preqs: EB 201 or 212; ACC 210 or 280. 3(3-0) F,S,Sum.* Financial decision making by businesses, including capital structure and dividend decisions, capital budgeting and working capital management. Basic financial concepts such as risk and return measurement, portfolio theory and the Capital Asset Pricing Model.
JONES, MITCHELL, POINDEXTER

EB 325 Managerial Economics. *Preq: EB 201 or 212. 3(3-0) F,S.* Economic principles applied to decision-making in the firm. The relationship between accounting and economic concepts of cost. Pricing for sales within and outside the firm. The consequences for the firm of the competitive economy. The meaning of risk. Decision-making under uncertainty. The implications of transactions costs for the organization of firms.
MARGOLIS, NEWMARK

EB 326 Human Resource Management. *Preq: EB 201 or 212. 3(3-0) F,S.* Issues faced by firms in attracting and maintaining a productive work force. Criteria for decisions by the profit-maximizing firm in determining wages, fringe benefits and working conditions. Job safety, on-the-job training, the behavior of unions, and government regulation in the labor market. ALLEN, CLARK, FEARN, PURYEAR

EB 332 Industrial Relations. *Preq: EB 201 or 212. 3(3-0) F,S.* The role of collective bargaining in the labor market. Determinants of the pattern of union membership today and its growth rate. The objectives and tactics of both labor and management within public policy guidelines. Analysis of the impact of unions on job security, productivity, and compensation. ALLEN

EB 346 International Business. *Preq: EB 201. 3(3-0) S.* Principles and conduct of international business. Environment of international trade and finance relevant to international business. Competitive advantages of multinational firms. International management issues in marketing, accounting, taxation, financial management and control, technology transfer, export-import management, and organizational form. Case studies and discussions. DUTTON

EB (ST) 350 Economics and Business Statistics. *Preqs: MA 114; EB 201 or 212. 3(3-0) F,S.* Introduction to statistics applied to economic and business problems. Emphasis on statistical estimation, inference, linear and multiple regression, and analysis of variance.
McDERMED

EB 404 Money, Financial Markets, and the Economy. *Preq: EB 302. 3(3-0) F,S,Sum.* Roles of money, credit, and financial institutions in a market economy. Allocation of credit, the determination of interest rates and security prices, and the activities of the Federal Reserve System. Pricing models. KRISHNASWAMY, PEARCE, POINDEXTER

EB 405 Regulatory Law. *Preq: EB 301. 3(3-0) F,S.* The major statutes regulating business with some policy discussion of the economic costs and benefits of current regulations and proposals for reform. A general introduction to the judicial system, environmental law, securities law, employment law, and product safety. BAUMER, HUGGARD

EB 420 Financial Management of Corporations. *Preq: EB 320. 3(3-0) F,S.* Advanced theory and practice of corporate financial management. Techniques for evaluating alternative investment, financing, capital structure, and dividend policy decisions. International aspects of corporate financial management. Use of personal computers in applying financial management theory to common financial problems.
AGRAWAL, KRISHNASWAMY, JONES, MITCHELL

EB 422 Investments and Portfolio Management. *Preqs: EB (ST) 350 or ST 311; and EB 320. 3(3-0) F,S.* Analysis of the investment process, dichotomized into security analysis and portfolio management. Background information on financial assets, securities markets, and risk-return concepts. Analysis of valuation theory and techniques, modern portfolio theory and portfolio performance. AGRAWAL, JONES, WILSON

EB 425 Quantitative Methods for Management. *Preqs: EB 201 or 212, and EB (ST) 350. 3(3-0) F,S,Sum.* Formulation and use of quantitative models in solving management problems. Linear programming, decision theory, and forecasting. Case studies of actual business problems; use of computer software packages.

EB 460 Marketing Research. *Preqs: EB 311 or 313; and EB (ST) 350. 3(3-0) F,S.* The use, collection, organization and analysis of information pertinent to marketing decisions. Use of qualitative and quantitative data in the solution of specific marketing problems.
GERSTNER, HESS, TANG

EB 465 Advertising and Promotion Management. *Preq: EB 313. 3(3-0) F,S.* Development of advertising theory and exploration of advertising practice. Topics include: advertising and marketing; planning, management and budgeting; strategy development and execution; media strategy and research; advertising research; economics, social and legal issues; promotion strategy; campaign development and presentation.

EB (TAM) 482 Textile Marketing Management. *Preqs: EB 313, EB 301, TMT 380. 3(2-2) F,S.* (See Textile Materials and Management).

EB (WPS) 485 Management Development Seminar. *Preqs: EB 201 or EB 212. This course may not be used for credit toward an economics minor for any graduate degree. 3(3-0) F.* Emphasis on developing insight into individual management potential and providing guidance and planning for a management career in industry, government services, or as an entrepreneur. Visiting lecturers.

EB 495 Special Topics in Economics and Business. *Preq: Consent of the Department. 1-6.* Presentation of material not normally available in regular course offerings, or offering of new courses on a trial basis.

EB 498 Independent Study in Economics and Business. *Preq: Consent of Department. 1-6. F,S,Sum.* Detailed investigation of topics of particular interest to advanced undergraduates under faculty direction on a tutorial basis. Credits and content determined by faculty member in consultation with Associate Department Head.

ECONOMICS

EB 201 Economics I. *Credit will not be awarded for both EB 201 and EB 212. Students interested in agriculture and natural resources should enroll in EB 212 instead of this course. 3(3-0) F,S,Sum.* Introduction to microeconomics. Basic tools of economic analysis for understanding how prices are determined in resource and product markets and how the price system is modified by private and public action.
HYMAN

EB 202 Economics II. *Preq: EB 201 or EB 212. 3(3-0) F,S,Sum.* Introduction to macroeconomics centering on the aggregate level of economic activity. Emphasis on the determination and measurement of national income, international economics, unemployment, inflation and money and how these are influenced by governmental monetary and fiscal policies.

EB 301 Intermediate Microeconomics. *Preqs: MA 113 or 112; EB 201 or 212. Credit not allowed for both EB 301 and 401. 3(3-0) F,S,Sum.* Functioning of the market economy: role of prices in determining the allocation of resources; the functioning of the firm in the economy; forces governing the production of economic goods.

EB 302 Intermediate Macroeconomics. *Preqs: EB 201 or EB 212; MA 113 or MA 112. 3(3-0) F,S,Sum.* Relates the economic behavior of households, business firms, the central bank, and government to the determination of the levels of national income, employment, inflation, and growth in production capacity. Problems of public policy-making in the pursuit of macroeconomic goals such as high employment, price stability, and adequate growth in the economy's production capacity.

EB 332 Industrial Relations. *Preq: EB 201 or 212. 3(3-0) F,S.* The role of collective bargaining in the labor market. Determinants of the pattern of union membership today

and its growth rate. The objectives and tactics of both labor and management within public policy guidelines. Analysis of the impact of unions on job security, productivity, and compensation. ALLEN, FEARN

EB (ST) 350 Economics and Business Statistics. *Preqs: MA 114; EB 201 or 212. 3(3-0) F,S.* Introduction to statistics applied to economic and business problems. Emphasis on statistical estimation, inference, linear and multiple regression, and analysis of variance. HULL, McDERMED

EB 370 The Rise of Industrialism. *Preq: EB 201 or 212. 3(3-0) F,S.* Historical development of the modern industrial economy from origins in medieval and early modern Europe. The industrial revolution in England and its diffusion throughout the western world and beyond. D. FISHER

EB 371 Evolution of the American Economy. *Preq: EB 201 or 212. 3(3-0) F,S.* Relationship of modern economic development to the history of America. Analysis of contemporary problems and issues with reference to their origins in the historical growth of the economy. BALL, CRAIG

EB 401 Economic Analysis for Nonmajors. *Preq: EB 201 or 212. Not open to undergraduates majoring in the Department of Economics and Business. Credit not allowed for both EB 301 and 401. 3(3-0) F,S.* Intermediate economic theory of firm, household, and market behavior primarily for graduate students desiring an economics minor at the master's level. Students who have taken intermediate microeconomics and calculus elect EB 501 instead. Topics include demand, production and cost theory, market equilibrium under competitive and non-competitive conditions, an introduction to general equilibrium theory, externalities and problems of economic efficiency. GRENNES, KNOEBER

EB 404 Money, Financial Markets, and the Economy. *Preq: EB 302. 3(3-0) F,S,Sum.* Roles of money, credit, and financial institutions in a market economy. Allocation of credit, the determination of interest rates and security prices, and the activities of the Federal Reserve System. Pricing models. FISHER, LAPP, PEARCE

EB 410 Public Finance. *Preq: EB 301. 3(3-0) F,S.* A micro-economic analysis of the rationale for public expenditure and taxation. Externalities, pollution and public policy, income redistribution and public welfare, public goods, collective choice and political institutions, public budgeting techniques and cost-benefit analysis, taxation and tax policy, state-local finance and fiscal federalism. HYMAN, KNOEBER

EB 413 Competition, Monopoly and Public Policy. *Preq: EB 301. 3(3-0) S.* Current theories of industrial organization with specific reference to such topics as cartels, industrial concentration, vertical integration, franchise contracts, ownership and control of firms, multipart and discriminatory pricing, and tie-in sales. Economic aspects of antitrust law and government regulation of industry. ERICKSON, FLATH, MARGOLIS, NEWMARK

EB 431 Labor Economics. *Preq: EB 301. 3(3-0) F,S.* An economic approach to the labor market and its problems including unemployment and the determination of wages, hours and working conditions under various labor market structures. The economic effects of trade unions. Introduction to human capital theory. ALLEN, CLARK, FEARN, WESSELS

EB 435 Urban Economics. *Preq; EB 301. 3(3-0) F,S.* Application of land use and location theory to urban structure and centralized economic activity. Analysis of trends in urbanization and suburbanization. Urban poverty, housing, transportation, pollution and financial problems. MARGOLIS, PALMQUIST

EB 436 Environmental Economics. *Preq: EB 301. 3(3-0) F,S.* Useful of economics in understanding pollution, congestion, conservation and other environmental problems. Relevant economic tools such as pricing schemes, abatement cost curves, damage functions and benefit-cost analysis. Pollution taxes, regulations and subsidies considered in designing alterations in the incentive system. Public policy alternatives examined in the context of non-market decision making. PALMQUIST, SMITH

EB 437 Health Economics. *Preq: EB 301 or EB 401. 3(3-0) F,S.* Applications of microeconomics tools to analysis of public and private policy issues concerning health care financing and delivery in the United States. HEADEN

EB 442 Evolution of Economic Ideas. *Preq: EB 201 or 212. 3(3-0) F,S.* General development of economic ideas from ancient times through Keynes. Emphasis on the classical school and developments thereafter. The evolution of economic ideas in the context of the changes in technology and the increasing complexity of economic activity.
FISHER, TURNER

EB 448 International Economics. *Preq: EB 301. 3(3-0) F,S.* Trade, investment, monetary relations and certain aspects of economic development. Emphasis on analytical and policy approaches with some study of specific international organizations.
BALL, DUTTON, GRENNES

EB 451 Introduction to Econometrics. *Preqs: EB 301, EB 302, EB(ST) 350. 3(3-0) F.* The measurement, specification, estimation and interpretation of functional relationships through single equation least-square techniques. Applications of simple and multiple regression, curvilinear regression and various transformations to demand, cost, production, consumption and investment relationships. HALL, McDERMED

EB 470 The Japanese Economy. *Preqs: EB 301; 3 hours HI. 3(3-0) S.* The Japanese economy from an ancient agrarian economy to a modern industrial nation. Comparative analysis of post-World War II Japanese macroeconomic growth, money and banking, public finance, labor markets, industrial organization, and international trade and finance.
FLATH

EB 475 Comparative Economic Systems. *Preq: EB 201 or 212. 3(3-0) F,S.* Review of capitalist and market economies. Comparison with collectivist economic systems, in particular the Soviet economy. TURNER

EB 490 Senior Seminar in Economics. *Preqs: EB 301, EB 302, EB(ST) 350 and two courses from list of economic electives. 3(3-0) F,S,Sum.* The terminal course for a student majoring in Economics and Business. The undergraduate students are assisted in summarizing their training and in improving their capacity to recognize problems, and to select logically consistent means of solving problems. The seminar is kept small to allow individualized instruction.

EB 495 Special Topics in Economics and Business. *Preq: Consent of the Department. 1-6.* Presentation of material not normally available in regular course offerings, or offering of new courses on a trial basis.

EB 498 Independent Study in Economics and Business. *Preq: Consent of Department. 1-6. F,S,Sum.* Detailed investigation of topics of particular interest to advanced undergraduates under faculty direction on a tutorial basis. Credits and content determined by faculty member in consultation with Associate Department Head.

Selected 500-Level EB Courses Open To Advanced Undergraduates

EB 501 Price Theory. *Preqs: MA 113 and EB 301. 3(3-0) F,S.*

EB 502 Income and Employment Theory. *Preqs: MA 113, EB 301, 302 and EB (ST) 350. 3(3-0) F,S.*

EB (RRA) 503 Economics of Recreation. *Preq: EB 301 or 401. 3(3-0).*

EB 504 Monetary and Financial Macroeconomics. *Preq: EB 502. 3(3-0) S.*

EB 512 Law and Economics. *Preq: EB 301 or EB 401. 3(3-0) Alt. F.*

EB 513 Research Methods in Marketing. *Preq: EB 313, EB(ST) 350, EB 501. 3(3-0) S.*

EB 515 Environmental and Resource Policy. *Preq: EB 301 or EB 401. 3(3-0) Alt. F.*

EB 520 Managerial Finance: Theory and Applications. *Preqs: EB 420 and EB 301 or 401. 3(3-0) S.*

EB 521 Markets and Trade. *Preq: EB 301 or 401. 3(3-0) F.*

EB 522 Portfolio and Capital Market Theory. *Preqs: EB 501 and EB 350 or ST 311. 3(3-0) F.*

EB 523 Planning Farm and Area Adjustments. *Preqs: EB 301, 303 or 401. 3(2-2) S.*

EB 524 Financial Markets. *Preq: EB 501. 3(3-0) S. Alt. yrs.*

EB 525 Managerial Economics. *Preq: EB 301 or 401. 3(3-0) Alt. S.*

EB 526 Human Resource Management. *Preq: EB 301. 3(3-0) F.*

EB 532 Economics of Trade Unions. *Preq: EB 301 or 401. 3(3-0).*

EB 533 Economics of World Food and Agricultural Policy. *Preq: EB 301 or 401. 3(3-0) S.*

EB 540 Economic Development. *Preq: EB 301 or 401. 3(3-0).*

EB 551 Agricultural Production Economics. *Preqs: MA 113 and EB 301 or EB 401. 3(3-0) S.*

EB 560 Marketing Management and Strategy. *Preq: EB 401 or EB 501. 3(3-0) F.*

EB (ST) 561. Intermediate Econometrics. *Preqs: EB 501 and ST 513. 3(3-0) S.*

EB 570 Analysis of American Economic History. *Preq: EB 371 or grad. standing or PBS status. 3(3-0) Alt. F.*

EB (SOC) 574 The Economics of Population. *Preq: EB 301 or 401. 3(3-0).*

EB (TMT) 585 Market Research in Textiles. *Preqs: TMT (EB) 482. 3(3-0) S.*

EB 590 Special Economics Topics. *Preq: CI. Maximum 6. F,S,Sum.*

COUNSELOR EDUCATION

ECD 101 University Orientation I. *Open to University Transition Program (UTP) students only. 1(1-0) F.* An orientation to academic requirements of the various colleges and departments at the University, a review of study skills and time management, advising procedures and decision-making skills, designed to assist students to develop a knowledge of major requirements and requisite comprehension and skills to succeed in college.

ECD 102 University Orientation II. *Open to University Transition Program (UTP) students only. 1(1-0) S.* An continuation of ECD 101, the course emphasizes the further development of study skills, time management and methods for the selection of a major field of study.

ECD 220 Introduction to Paraprofessional Counseling. *Preq: Sophomore standing. Priority will be given to resident advisors and students active in student organizations or volunteer programs. 2(2-0) F,S.* A study of peer counseling concepts with opportunity for the development of paraprofessional counseling skills. Major consideration is given to developmental issues of young adulthood and crisis intervention.

ECD 221 Career Planning and Personal Development. *3(3-0) F,S.* Knowledge, attitudes, self-understanding, and skills needed to enhance career planning and foster personal development. Study of self-understanding, self-talk, goal setting, the environment, and decision making as ways to adapt more effectively to the challenges of life.

ECD 400 Value Development. *Preq: Junior standing. 2(2-0) S.* Kohlberg's theory of the development of moral judgment applied to value dilemmas commonly confronted by young adults and adults in general. Structured and unstructured identification of stages of moral reasoning. Independent formulation of value dilemma issues. Basic small group communication skills for synthesis of value dilemma issues and their analysis. SPRINTHALL

ELECTRICAL AND COMPUTER ENGINEERING

ECE 211 Electric Circuits I. *Preqs: Soph. standing and GPA 2.4 or above, with a grade of C or better in ENG 111, MA 141, MA 241, and PY 205. Coreqs: PY 208, MA 242. Independent study version may be taken only with approval of ECE undergraduate administrator. 3(3-0) F,S,Sum.* Introduction to theory, analysis and design of electric circuits. Circuit parameters and elements: voltage, current, power, energy, resistance, capacitance, inductance. Kirchhoff's laws and circuit-analysis techniques. Linearity, superposition, Thevenin's theorem. Active circuit elements and elementary amplifiers. Transient response of energy-storage circuits. Periodic functions, RMS values, phasors. Sinusoidal-steady-state response, resonance, Q, bandwidth. Introduction to frequency response.

ECE 212 Fundamentals of Logic Design. *Preq: Soph. standing and GPA 2.4 or above, with a grade of C or better in ENG 111, MA 141, MA 241 and PY 205. 3(3-0) F,S,Sum.* Introduction to digital logic design: Boolean algebra, switching functions, Karnaugh maps, modular combinational logic, flip-flops, latches, synchronous sequential circuits, case studies in asynchronous digital design.

ECE 213 Electric Circuits I Laboratory. *Preq: ECE 211 (independent study students); Coreq: ECE 211. 1(0-3) F,S,Sum.* Laboratory work on material treated in ECE 211 emphasizing elementary design principles.

ECE 214 Fundamentals of Logic Design Laboratory. *Coreq: ECE 212. 1(0-3) F,S,Sum.* Laboratory on material treated in ECE 212 emphasizing elementary design principles.

ECE 218 (Formerly ECE 318) Computer Organization and Microprocessors. *Preq: CSC 101 and a grade of C or better in ECE 212. 3(2-3) F,S.* Digital computer organization. Assembly language programming. Input/output. Interrupts and traps. Direct memory access. Structured program development. Comparison of microprocessor architectures. Detailed study of Motorola 68000.

ECE 221 (Formerly ECE 302) Electrical Circuits II. *Preq: A grade of C or better in ECE 211. 3(3-0) F,S.* Continuation of study of electric circuits. Multi-port networks. two-port networks with energy storage, ideal transformers. Analysis and design of nonlinear devices and linear models, load-line methods, diodes, and transistor models. Transients in linear circuits, complex impedance. AC power and three-phase circuits. Y-Delta equivalents, complex power. Amplifiers and frequency response, s-domain, Bode plots, filters. Matrix methods in circuit analysis and design.

ECE 223 Electric Circuits II Laboratory. *Coreq: ECE 221. 1(0-3) F,S.* Laboratory work on material treated in ECE 221 emphasizing elementary design principles.

ECE 301 Linear Systems. *Preq: A grade of C or better in ECE 221. 3(3-0) F,S.* Representation and analysis of linear systems using differential equations: impulse response and convolution, Fourier series, Fourier and Laplace transformations. Emphasis on interpreting system descriptions in terms of transient and steady-state response. Analysis of discrete-time systems.

ECE 303 Electromagnetic Fields. *Preqs: MA 341 and a grade of C or better in ECE 221. 3(3-0) F,S.* Static electric and magnetic fields. Early experimental laws and their relation to Maxwell's equations. Force laws and particle ballistics. Propagation, reflection and refraction of plane waves. Transient and steady-state behavior of waves on transmission lines.

ECE 305 Electric Power Systems. *Preq: A grade of C or better in either ECE 221 or ECE 331. 3(3-3) F,S.* Principles, performance and characteristics of power-system components, including direct-current and alternating-current machinery, transformer banks and transmission lines. Principles and analysis of system power flow.

ECE 314 Electronic Circuits. *Preq: A grade of C or better in ECE 221. 3(3-3) F,S.* Design concepts for digital and analog integrated circuits such as logic gates, memory, and operational amplifiers employing junction diodes, bipolar junction transistors and field-effect (MOS) transistors.

ECE 331 Principles of Electrical Engineering I. *Preqs: MA 241, PY 208. Not available to EE and CPE majors. 3(3-0) F,S,Sum.* Concepts, units and methods of analysis in electrical engineering. Analysis of d-c and a-c circuits, characteristics of linear and non-linear electrical devices, transformers, motors and control systems.

ECE 332 Principles of Electrical Engineering II. *Preq: ECE 331. Not available to EE and CPE majors. 3(3-0) F,S,Sum.* Principles of electronics, instrumentation and computers. Digital gates and logic systems, operational amplifiers with applications in instruments and analog computers, measuring instruments, microcomputers, sensors and transducers.

ECE 339 Principles of Electrical Engineering Laboratory. *Coreq: ECE 331. Not available to EE and CPE majors.* Laboratory work in the material covered in ECE 331. 1(0-3) F,S.

ECE 341 Solid-State Devices. *Preq: A grade of C or better in ECE 221. Credit is not permitted in both ECE 341 and ECE 441. 3(3-0) F,S.* Basic principles required to understand the operation of modern solid-state devices. Derivation of electrical characteristics of devices such as diodes, bipolar transistors, MOS transistors and LEDs. Applications to design of electronic circuits.

ECE 342 Design of Complex Digital Systems. *Preq: A grade of C or better in ECE 218. 3(3-3) F,S.* Design principles for complex digital systems. Iteration, top-down, bottom-up, divide and conquer, and decomposition. Descriptive techniques, including block diagrams, timing diagrams, register transfer, and hardware-description languages. Consideration of transmission-line effects on digital systems.

ECE 401 Introduction to Signal Processing. *Preqs: ECE 301, ECE 221. 3(3-0) F,S.* Concepts of electrical signal processing. Fourier series, Fourier transform, Z-transform, advanced linear systems and stochastic processes. Analog/digital and digital/analog conversion, digital filters and modulation. Major design project.

ECE 409 Introduction to Telecommunications Engineering. *Preq: ECE 301, MA 314. 3(3-0) F,S.* Design and operation of telecommunications systems: switching hierarchy, characteristics of signals and impairments, measurements of signals and noise, transmission media, teletraffic theory, switching systems.

ECE 431 Electronics Engineering. *Preqs: ECE 301, ECE 314. 3(2-3) F,S.* Design and analysis of discrete and integrated electronic circuits, from single-transistor stages to operational amplifiers, using bipolar and MOS devices. Feedback in operational amplifier circuits, compensation and stability. Laboratory design projects.

ECE 432 Communication Engineering. *Preqs: ECE 301, ECE 314, MA 314. 3(2-3) F,S.* Fundamentals of communications engineering. Elements of systems including modulators, demodulators, transmitters, receivers. Bandwidth allocation and optimization examined in time and frequency domains. Laboratory design project involving a complete communications system.

ECE 435 Elements of Control. *Preqs: ECE 301, ECE 221, ECE 314. 3(2-3) F.* Introductory theory of open- and closed-loop control. Dynamic analysis of error detectors, amplifiers, and motors. Component transfer characteristics and block diagram representation.

ECE 436 Digital Control Systems. *Preq: ECE 435. 3(3-0) S.* Discrete systems dynamics, sampled-data systems, mathematical representations of analog/digital and digital/analog conversions, open- and closed-loop systems, input-output relationships, state-space and stability analyses, time- and frequency-domain analyses. Design of digital controllers.

ECE 439 Integrated Circuit Technology and Fabrication. *Preq: ECE 441. 3(2-2) F.* Semiconductor device and integrated-circuit processing and technology. Wafer specification and preparation, oxidation, diffusion, ion implantation, photolithography, design rules and measurement techniques.

ECE (CSC) 440 Digital Systems Interfacing. *Preq: A grade of C or better in either ECE 218 or CSC 312. 3(2-3) F,S.* Concepts of microcomputer system architecture and applications to fundamental computer hardware. Theory and practical experience in digital system interfacing using a variety of microprocessor peripheral chips with specific microprocessor/microcomputer systems. Practical aspects of interfacing real-world devices to a microcomputer system both from hardware and software points of view.

ECE 441 Introduction to Solid-State Devices. *Preqs: ECE 314, ECE 303. 3(3-0) F,S.* Basic principles required to understand the operation of solid-state devices. Semiconductor device equations developed from fundamental concepts. P-N junction theory developed and applied to the analysis of devices such as varactors, detectors, solar cells, bipolar transistors, field-effect transistor. Emphasis on device physics rather than circuit applications.

ECE 443 Advanced Microprocessor Systems Design. *Preq: ECE 342. 3(2-3) F,S.* Advanced topics in microprocessor systems design, including processor architectures, virtual-memory systems, multiprocessor systems, and single-chip microcomputers. Architectural examples include a variety of processors of current interest, both commercial and experimental. Major design project.

ECE 444 Computer Control of Robots. *Preqs: ECE 314 and a grade of C or better in ECE 218. 3(2-3) F,S.* Techniques of computer control of industrial robots: Interfacing with synchronous hardware including analog/digital and digital/analog converters, interfacing noise problems, control of electric and hydraulic actuators, kinematics and kinetics of robots, path control, force control, sensing including vision. Major design project.

ECE 446 VLSI Systems Design. *Preqs: ECE 314 and a grade of C or better in ECE 218. 4(3-2) F,S.* Digital systems design in MOS VLSI technology: MOS device physics, fabrication, primitive components, design and layout methodology, integrated systems, architectures, timing and testing. Trends in VLSI technology. Major design project.

ECE 448 TransmissionLines, Waveguides and Antennas. *Preq: ECE 303. 3(3-0) F.* Transmission and propagation of electromagnetic waves by means of transmission lines, waveguides and antennas. Striplines, directional couplers, metal waveguides, optical fibers and elementary antennas.

ECE 451 Power System Analysis. *Preq: ECE 305. 3(3-0) F.* Long-distance transmission of electric power with emphasis on load flow, economic dispatch, fault calculations and system stability. Applications of digital computers to power-system problems. Major design project.

ECE 452 Power Systems Protection. *Preq: ECE 451. 3(3-0).* Elements of protective systems. Principles, construction and operating characteristics of different types of relays. Relays as comparators. Instrument transformers for relaying. Principles and applications of overcurrent, differential, distance and carrier protection. Introduction to digital protection. Design project.

ECE 453 Distribution System Analysis, Design and Operation. *Preq: ECE 305. 3(3-0) S.* Electric power distribution systems: load characteristics, short-term load forecasting, capacitive compensation, voltage regulation and control. Distribution transformers. Design of subtransmission and distribution substations, distribution primary systems. Distribution system operations and automation.

ECE 454 Electric Machinery. *Preq: ECE 305. 3(3-0) S.* Magnetic circuits, transformers, forces and torques in singly- and multiply-excited magnetic fields, dynamic equations of electromechanical devices, principal concepts of rotating machines. Performance of d-c, synchronous and induction machines in transient and steady states.

ECE 455 Computer Control of SCR Motor Drives. *Preq: ECE 305 or ECE 331. 3(1-4) S.* Principles of design of silicon-controlled rectifier (SCR) drives for d-c motors operating from single-or three-phase a-c sources. Feedback strategies for computer control of SCR firing angles. Major design project.

ECE 457 Semiconductor Power Conversion. *Preq: ECE 314. 3(3-0) F.* Theory and practice of using diodes and thyristors for large-scale conversion of electric power. Rectification, commutation, faults, input/output harmonic content, phase control of power flow. Integers and modes of operation. Bi-directional (four-quadrant) power-flow control techniques.

ECE 480 Senior Design Project in Electrical Engineering. *Preq: ECE 218, 301, 303, 305, 314, 341; COM/SP 110; ENG 331. EE majors only. 4(3-3) F,S.* Applications of engineering and basic sciences to the total design of electrical engineering circuits and systems. Consideration of the design process including feasibility study, preliminary design detail, cost effectiveness, along with development and evaluation of a prototype accomplished through design team project activity. Complete written and oral engineering report required.

ECE 481 Senior Design Project in Computer Engineering. *Preqs: ECE 301, 314, 342; CSC 202, 311; COM/SP 110; ENG 331. CPE majors only. 4(3-3) F,S.* Application of engineering and basic sciences to the total design of hardware and software systems. Consideration of the design process including feasibility study, preliminary design detail, cost effectiveness, along with development and evaluation of a prototype accomplished through design team project activity. Complete written and oral engineering report required.

ECE 492 Special Topics in Electrical and Computer Engineering. *Preq: CI. 1-4 F,S.* Offered as needed for development of new courses in electrical and computer engineering.

Selected 500-Level Courses Open To Advanced Undergraduates

Undergraduates taking 500-level ECE courses must have a B or higher average in ECE and MA courses.

ECE (CSC) 506 Digital Systems Architecture. *Preq: ECE 340 or CSC 312. 3(3-0) F.*

ECE (CSC) 510 Software Engineering. *Preqs: CSC 311 and CSC 322 or equivalent. 3(3-0) F.*

ECE 511 Analog Electronics. *Preq: ECE 431. 3(2-3) F.*

ECE (CSC) 512 Compiler Construction. *Preq: CSC 311. 3(3-0) S.*

ECE (CSC) 513 Digital Signal Processing. *Preqs: ECE 401. 3(3-0) S.*

ECE 514 Random Processes. *Preq: ECE 301. 3(3-0) F.*

ECE 516 System Control Engineering. *Preq: ECE 435 or ECE 301. 3(3-0) F.*

ECE (CSC) 520 Fundamentals of Logic Systems. *Preq: ECE 318. 3(3-0) F.*

ECE (CSC) 521 Digital Computer Technology and Design. *Preq: ECE 342. 3(3-3) S.*

ECE 525 Optical Signal Processing. *Preq: ECE 301. 3(3-0) F.*

ECE 530 Physical Electronics. *Preq: ECE 303. 3(3-0) F.*

ECE 531 Principles of Transistor Devices. *Preq: ECE 441. 3(3-0) S.*

ECE 532 Principles of Microwave Circuits. *3(3-0) F.*

ECE (CSC) 533 Digital Electronics. *Preq: ECE 314. 3(3-0) S.*

ECE 537 Microwave Device Characterization Techniques. *Preq: ECE 448. 3(1-5) F.*

ECE 538 Integrated Circuit Technology and Fabrication. *Preq: ECE 441. 3(3-0) F.*

ECE 540 Electromagnetic Fields. *Preq: ECE 448. 3(3-0) S.*

ECE (CSC) 542 Database Management. *Preq: CSC 431 or CS (ECE) 501. 3(3-0) F.*

ECE 547 VLSI Architecture. *Preq: ECE 446, ECE 401. 3(3-0) S.*

ECE 550 Power System Operation and Control. *Preqs: ECE 305 or ECE 331. 3(3-0) F.*

ECE (CSC) 571 Data Transmission/Communications. *Preqs: CSC 312 or ECE 340; ECE 301. 3(3-0) S.*

ECE (CSC, CSE) 572 Computer Communications. *Preq: CSC 312 or ECE 340. 3(3-0) F.*

ECE 591, 592 Special Topics in Electrical and Computer Engineering. *3(3-0) F,S.*

ECE 593 Individual Topics in Electrical and Computer Engineering. *1-3 F,S.*

CURRICULUM AND INSTRUCTION

ECI 102 Orientation to Middle Grades Education. *Restricted to MSL majors and unclassified students in MSL certification program only. 0(1-0) F,S.* Orientation and introduction to department, college, and university expectations and procedures. Advisor/advisee interaction and discussion of practical aspects of academic life. HARPER

ECI 105 Reading and Learning Strategies for Academic Performance. *Required for students identified as being deficient in reading and learning skills. 3(3-0) F,S.* Provides instruction and practice in academic reading and learning strategies; emphasis is placed on the process of comprehending and retaining textbook and lecture information in order to enhance performance in academic courses.

ECI 200 Principles for Teaching Geography. *3(3-0) S.* Basic ideas in the field of geography. The scope of geography as an academic field is explored. Emphasis placed on mastery of tools needed for teaching geography, e.g., maps, globes, pictures, graphs, landscape, and media materials and sources. Provides an understanding of the interaction between people and their physical environment. HARPER

ECI 205 Introduction to Teaching Humanities and Social Sciences. *Preq: Sophomore standing. 3(2-3) S.* For prospective teachers in secondary and middle years social studies, English, language arts, and foreign languages. An emphasis on differing aspects and procedures of instruction and analysis of the competencies required of teachers. Field work in a variety of educational settings including an extended period in one curriculum area.

ECI 210 College Tutoring. *Preq: Registration priority will be given to students who plan to become tutors or who are tutoring. 2(2-0) F,S.* Develop skills in general tutoring. Areas of emphasis include recognizing and responding to various learning difficulties, implementing a variety of tutoring methods and developing self-evaluation of effective tutoring skills.

ECI 296 Special Topics in Education. *1-3. F,S,Sum.* Individual or group study of particular areas of education at the freshman and sophomore levels. Specific topics will vary from semester to semester. *The suffix will indicate the department offering the course: (A) Counselor Education, (B) Occupational Education, (C) Curriculum and Instruction, (D) Mathematics and Science Education, (F) Adult and Community College Education, (L) Education Leadership and Program Evaluation.*

ECI 306 Middle Years Reading. *Preq: 6 hours ED and/or PSY. 3(3-0) S.* Methods and materials for teaching reading skills in middle years with emphasis on application of the reading process to content area reading.

ECI 307 Teaching Writing Across the Curriculum. *Preq: ENG 112. 3(3-0) S.* Designed for prospective teachers of all disciplines and grade levels. Practical strategies for using writing as a learning tool and enhancing composing ability. Students participate as writers and learners while developing writing lessons and assignments appropriate to their content areas. PRITCHARD

ECI 309 Teaching in the Middle Years. *Preq: 6 hours ED/PSY. 3(3-0) S.* Examines the nature and purposes of middle and junior high schools. Explores early adolescent development, curriculum, teaching/learning methods, school organization, and characteristics of effective middle years teachers. ARNOLD

ECI (ENG) 405 Literature for Adolescents. *Preq: Junior standing or above. 3(3-0) F.* The history, types, and characteristics of literature for adolescents. Emphasizes reading and analyzing the literature by exploring the themes, literary elements, and rationale for teaching literature for adolescents. Addresses ways in which this literature can be integrated and implemented in English/Language Arts curriculum. POPE

ECI 414 Human Relations and Discipline in the Classroom. *Preqs: PSY 304 and 6 hours of education. 3(3-0) F.* Designed to help prospective teachers foster positive interpersonal relationships in classrooms, build a sense of community and create a purposive environment for learning. Investigates issues such as group building, active listening, and major approaches to discipline. Uses case studies and problem solving methods.

ECI 415 The Arts and Adolescence. *Preq: 6 hours ED and/or PSY. 2(2-0) S.* The relationship of the arts to the academic work of adolescent learners. Explores arts and adolescent development; arts and learning processes within and outside of the classroom; experimentation and skill development in graphic arts, sculpture, music, drama, dance/-movement, film, and poetry.

ECI 416 Teaching Exceptional Students in the Mainstreamed Classroom. *Preq: Six hours ED and/or PSY. 3(3-0) S.* Provides classroom teachers in all disciplines and grade levels with a knowledge of various handicapping conditions, as well as with techniques to assist exceptional students within the mainstreamed classroom.

ECI 423 Methods and Materials in Teaching Modern Foreign Languages. *Preq: Admission to Professional Semester; Coreq: ECI 424. 5(Course scheduled 15 hrs. each week for 7 weeks of which eight days (24 class hrs.) is practicum.) F.* Methods and materials for teaching modern languages K-12 including the use of instructional media.

ECI 424 Student Teaching in French or Spanish. *Preq: Admission to professional semester. Coreq: ECI 423. S(2-15) F.* Provides prospective teachers of French or Spanish a ten-week teaching experience in a selected school, under the supervision of a cooperating high school teacher and a university faculty supervisor. MALINOWSKI

ECI 430 Methods and Materials for Teaching Language Arts in the Middle Grades. *Preq: Admission to professional semester. 4(3-2) F.* Demonstration and activity-oriented course provides opportunities for prospective teachers to integrate their knowledge of subject matter with effective materials and methods of instruction. Students make guided observations, plan lessons and units, and practice varied classroom models and strategies in micro-lessons. Prepare students for their responsibilities in teaching language arts in the middle schools. POPE

ECI 435 Methods and Materials for Teaching Social Studies in the Middle Grades. *Preq: Admission to professional semester. 4(3-2) F.* Teaching techniques and development of teaching and evaluation skills in middle grades social studies. Adapting instruction to individual learner differences. Creating instructional materials appropriate for use in social studies teaching. MARTORELLA

ECI 450 Methods and Materials in Teaching English. *Preqs: ECI 205, 344, PSY 304; senior standing and admission to Teacher Education candidacy with a major in English. Taught during the first seven weeks of the semester. 4(3,2) F.* Methods and materials of teaching English in grades 9-12, with an emphasis on student application and practice in teaching literature, study skills, speaking, listening, and writing. PRITCHARD

ECI 451 Improving Reading in Secondary Schools. *Preq: 6 hours of ED and/or PSY. 2(2-0) F,S,Sum.* A study of methods and materials for teaching reading in the secondary school, with an emphasis on the effective use of written materials for content area instruction. FOX

ECI 454 Student Teaching in English/Language Arts. *Preqs: Admission to Student Teaching Professional Semester. For MSL: ECI 430; 414; 464; for LTN: ED 450. 1-8 F.* Provides the prospective teacher with experience in the techniques and skills involved in teaching English or Language Arts. Ten weeks in a selected off-campus station. Student teachers become familiar with the total school program and participate in selected school and community activities. POPE, PRITCHARD

ECI 460 Methods and Materials in Teaching Secondary School Social Studies. *Preqs: ECI 205, EDL 344, sr. standing and admission to professional semester with a major in either history, sociology, political science. Taught during the first seven weeks of the semester. 4(3-1) F.* Teaching techniques, innovations, and development of teaching and

evaluation skills in the area of secondary school social studies. Adaptation of instruction to individual learner differences, and selection and design of instructional materials. Taught during the first seven weeks of the semester. HARPER

ECI 464 Student Teaching in Social Studies. *Preqs: Admission to professional semester; Coreq: for LTH, LTP, LTS: ECI 460; for MSL: ECI 454, 430, 414. 3-8 (2-18) F.* Skills and techniques in teaching social studies in secondary and middle schools. Each student spends ten weeks in a selected off-campus center. The student demonstrates competencies essential for teaching social studies, becomes familiar with the total school program, and participates in a variety of school and community activities. HARPER

ECI 483 An Introduction to Media and Instructional Technology. *Preq: Junior standing. 3(3-0) F,S.* Survey of instructional media and instructional technology. Relationship between media and instructional objectives. Projects in designing and developing instructional media materials and using instructional computing software. VASU

ECI 488 Basic American Sign Language. *3(3-0) F.* Skill training in basic vocabulary acquisition and grammar of American Sign Language, ASL, used by a majority of deaf people who sign.

ECI 496 Special Topics in Education. *Preq: Junior or senior standing and consent of instructor. 1-3 F,S,Sum.* Individual or group study of special topics in professional education. The topic and mode of study are determined by the faculty member after discussion with the student.

EDUCATION

ED 103 Teaching Fellows Seminar. *1(0-2) F.* An orientation to academic requirements of higher education, a review of teacher education components and elements of teacher education curricula, identification of characteristics of an effective student, and an introduction to instructional methods and issues in the field of education. JONES

ED 111 Education and Psychology Scholars Forum. *Preq: Enrollment limited to participants in the Education and Psychology Scholars Program. 0(2-0) F,S.* Interdisciplinary seminar with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

ED 211 Education and Psychology Scholars Forum. *Preq: Enrollment is limited to participants in the Education and Psychology Scholars Program. 0(2-0) F,S.* Second level of interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

EDUCATIONAL LEADERSHIP AND PROGRAM EVALUATION

ELP 201 Alternative Education Agencies. *3(3-0) F.* Explores alternate forms of education beyond the setting of the formal school. Content includes a variety of educative mechanisms in society as they relate to socio-economic and demographic characteristics and emerging values. SEROW

ELP 296 Special Topics in Education: General Studies. *1-3. F,S,Sum.* Individual or group study of particular areas of education at the freshman and sophomore levels. Specific topics will vary from semester to semester.

ELP 344 School and Society. *Preq: Jr. standing. 3(3-0) F,S,Sum.* The interrelationship between the school and other institutions, values, and patterns of thought in American society. BEEZER, BITTING, SEROW

ELP 496 Special Topics in Education: General Studies. *Preq: Junior or senior standing and consent of instructor. 1-3 F,S,Sum.* Individual or group study of special topics in professional education. The topic and mode of study are determined by the faculty member after discussion with the student.

MATHEMATICS/SCIENCE EDUCATION

EMS 101 Orientation to Mathematics and Science Education. *Open only to students in Math and Science Education. 0(1-0) F,S.* Overview of departmental expectations and procedures and introduction to practical aspects of academic life. Opportunity for interaction of students with advisors and with other undergraduates who are nearing completion of programs.

EMS 203 Introduction to Teaching Mathematics and Science. *3(2-3) F,S.* Introduces prospective teachers to the teaching of mathematics and science in the middle and secondary school. As an important part of the course students serve as aides to a classroom teacher in a middle or secondary school. Ideas and questions arising from this experience provide an integral part of the classroom instruction on campus.
ANDERSON, NORWOOD, WATSON, WHEATLEY

EMS 296 Special Topics in Education. *1-3.* Individual or group study of particular areas of education at the freshman and sophomore levels. Specific topics will vary from semester to semester.

EMS 470 Methods and Materials for Teaching Mathematics. *Preq: Admission to professional semester. Taught during the first seven weeks of the semester. 3(3-0) F.* A study of the purposes, methods, materials, curricula and evaluation practices appropriate for teachers of mathematics at the secondary level.
KOLB, NORWOOD, STIFF, WATERS, WATSON

EMS 471 Student Teaching in Mathematics. *Preq: Admission to professional semester; Coreqs: ED 470. 3-8 F.* Supervised practice in a selected middle or secondary school for 10 weeks, to develop the skills and techniques for teaching mathematics.
KOLB, NORWOOD, STIFF, WATERS, WATSON

EMS 472 Teaching Mathematics Topics in Senior High. *Preq: Admission to professional semester; Coreq: ED 470. Taught during the first 7 weeks of the semester. 3(3-0) F.* Preparation for teaching mathematics from both the college preparatory (algebra, geometry, trigonometry, advanced mathematics) and general courses (general mathematics, technical and consumer mathematics) offered in grades 9-12.
KOLB, NORWOOD, STIFF, WATERS, WATSON

EMS 474 Teaching Mathematics Topics in the Middle Grades. *Preq: Admission to professional semester; Coreq: ED 470. Taught during the first 7 weeks of the semester. 3(3-0) F.* Methods of teaching arithmetic, geometry, and pre-algebra topics in grades 6-9. Emphases approaches that actively involve learners and relate operations on content and pictorial representations to mathematical symbols. KOLB, NORWOOD, STIFF, WATSON

EMS 475 Methods of Teaching Science. *Preqs: ED 203, 344, PSY 304. Coreq: ED 476. Taught during the first seven weeks of the semester. 3(3-0) F.* Goals, methods, curricula, and evaluation practices in teaching the physical and biological sciences at the middle and secondary school levels. ANDERSON, PARK, WHEATLEY

EMS 476 Student Teaching in Science. *Preqs: ED 203, Ed 344, PSY 304; Coreq: ED 475. Students must have senior standing and be admitted to the professional semester. 3-8. F.* Supervised classroom experience in developing the skills and techniques for teaching science in a selected middle or secondary school for 10 weeks.
ANDERSON, PARK, WHEATLEY

EMS 477 Instructional Materials in Science. *Preqs: ED 203, 344, PSY 304; Coreqs: ED 475, 476. Part of professional semester; 2 lecture hours and 6 lab hours per week for 7 weeks. 2(1-3)F.* Development and selection of teaching materials that reflect concepts of content and emphasis in middle and secondary school science. Experimental and laboratory approaches. ANDERSON, PARK, WHEATLEY

EMS 480 Teaching Mathematics with Microcomputers. *Preqs: CSC 101, ED 203; MA 102 or 112. 3(2-2) F,S.* Techniques and skills needed to use the microcomputer as a tool in mathematics learning. Issues and research findings affecting the use of microcomputers in mathematics instruction. Development of computing and problem solving skills in areas of the secondary school mathematics curriculum such as algebra, geometry and statistics. KOLB, STIFF

EMS 495 Senior Seminar in Mathematics and Science Education. *Preq: Advanced undergraduate and consent of department. 1-3* An in-depth investigation of a teaching area in mathematics or science education during or after the student teaching semester.

EMS 496 Special Topics in Education. *Preq: Junior or senior standing and consent of instructor. 1-3.* Individual or group study of special topics in professional education. The topic and mode of study are determined by the faculty member after discussion with the student.

ENGLISH

FRESHMAN ENGLISH

ENG 102 Freshman English. *Credit not given for ENG 102 and either ENG 111 or ENG 112. 3(3-0) F,S,Sum.* Argumentative writing: framing issues, making and developing arguments in relation to written literature of various kinds, organizing and expressing ideas effectively; conventions of standard written English, dimensions of style, use of evidence and documentation of sources, and analytical, interpretive, and evaluative reading skills. Reading and writing as related, interactive processes. At least nine separate evaluated papers.

ENG 110 Developmental English. *Credit is not applicable toward graduation in any curriculum. Students placed in ENG 110 must receive a grade of S in order to advance to ENG 111. 3(3-0) F,S,Sum.* Development of basic writing skills, through supervised writing, analyzed readings, and self-paced drills. Parts of speech; principles of spelling, capitalization, and punctuation; vocabulary study; and composition of sentences, simple paragraphs and short essays. Role of invention and revision in the writing process.

ENG 111 Composition and Rhetoric. *Successful completion of ENG 111 requires a grade of C or better. 3(3-0) F,S,Sum.* Intensive study and practice in the basic forms and principles of expository communication; emphasis on correctness in writing and skill in organization; weekly exercises in composition planned out of class and executed in class; frequent conferences with instructor.

ENG 112 Composition and Reading. *Preq: A grade of C or better in ENG 111. 3(3-0) F,S,Sum.* Continued practice in expository writing; numerous short themes and a research paper; introduction to literary types; frequent conferences.

NOTE: ENG 111 and 112 must be scheduled in successive semesters until they are completed satisfactorily.

NOTE: Qualified students will be allowed to register for ENG 112H and will be given credit for ENG 111 upon successful completion of the course. Eligibility for ENG 112H is based on the student's predicted grade in English.

WRITING AND LANGUAGE

The prerequisite for all courses in writing and language at the 200-level and above is the completion of ENG 111 and ENG 112.

ENG 214 Introduction to Editing. *3(3-0) F,S,Sum.* Basic editorial skills for working with a wide range of publications. Stylistic editing (conventions of written English, consistency, effectiveness of syntax, appropriateness of diction), substantive editing (accuracy, legal issues, ethics), and production editing (layout, typography, electronic publication processing). Introduction to resources such as standard reference works and professional organizations.

ENG 215 Principles of News and Article Writing. *3(3-0) F,S,Sum.* Introduction to the techniques of conducting interviews and writing news stories including feature articles for a variety of news media. COCKSHUTT, KOCHERSBERGER

ENG 288 Fiction Writing. *3(3-0) F,S.* Experience in writing short prose fiction. Class critiquing of student work and instruction in techniques of fiction. KESSEL, SMITH

ENG 289 Poetry Writing. *3(3-0) F,S.* Experience in writing poetry. Class critiquing of student work and instructions in techniques of poetry. BARRAX, KATZ

ENG 302 Writing in Arts and Sciences. *Preq: ENG 102: 40 hours of credit towards degree. 3(3-0) F,S,Sum.* Writing in a variety of situations on topics selected from the sciences, social sciences, and humanities. Rhetoric analysis of written texts. Practice in inquiry and argument. Interaction of subject matter, discursive context, authorial purpose, language, and audience. Series of papers of varying lengths.

ENG 315 Advanced News and Article Writing. *Preq: ENG 215. 3(3-0) S.* A journalism course emphasizing writing news stories, profiles, features and investigative stories and including analysis and critical reading of print media.
COCKSHUTT, KOCHERSBERGER

ENG 322 Advanced Composition and Rhetoric. *Preq: Junior standing. 3(3-0) F,S,Sum.* Classical and modern views of rhetoric and psychological and social aspects of writing. Varied practice in writing; assignments with different audiences, aims, contexts, and conventions. CARTER, HERNDL, C. MILLER, PENROSE

ENG 324 Modern English. *Preq: ENG 112. 3(3-0) F.* Study of Modern English at the sentence level. Analysis of grammatical structure. Problems of composition and variety in language. CHASKI, FENNELL

ENG 325 Linguistic Awareness. *3(3-0) S.* Basic issues in the study of language; linguistic terminology and categories; grammatical traditions and topics such as prescriptivism and descriptivism, standard and non-standard, orality and literacy; language acquisition and awareness; language aesthetics and ethics.

ENG 326 History of the English Language. *Preq: ENG 112. 3(3-0) S.* Development of the English language from its Indo-European origins to the present. Emphasis on historical and comparative linguistic methodology and on detailed changes in sound, syntax, and meaning. FENNELL, MEYERS

ENG 331 Communication for Engineering and Technology. *Preq: Junior standing. Credit is not allowed for more than one of ENG 331, ENG 332, and ENG 333. 3(3-0) F,S,Sum.* Written communication in industrial and technical organizations, emphasizing internal communication with managers and technical personnel and including external communication with regulators, vendors, and clients. Intensive practice in writing; relationship of writing to oral and visual communication. For students in engineering and other primarily technological curricula.

ENG 332 Communication for Business Management. *Preq: Junior standing. Credit is not allowed for more than one of ENG 331, ENG 332, and ENG 333. 3(3-0) F,S,Sum.* Written communication in business and public organizations, including both internal communication (such as instructions, policies, management reports) and external communication with

clients, vendors, and publics. Intensive practice in writing; relationship of writing to oral and visual communication. For students in business and management-related programs.

ENG 333 Communication for Science and Research. *Preq: Junior standing. Credit is not allowed for more than one of ENG 331, 332, and 333. 3(3-0) S.* Written communication in scientific and research contexts, emphasizing relationship between research and writing in problem formulation, interpretation of results, and support and acceptance of research. Intensive practice in writing; relationship of writing to oral and visual communication. For students who plan careers in scientific research.

ENG 488 Advanced Fiction Writing. *A grade of B or better in ENG 288 or 289, or demonstrated competence in creative writing. 3(3-0) F,S.* Workshop in creative writing for the student with demonstrated understanding of the basic techniques of writing prose fiction.
KESSEL, SMITH

ENG 489 Advanced Poetry Writing. *A grade of B or better in ENG 288 or 289, or demonstrated competence in creative writing. 3(3-0) S.* Workshop in creative writing for the student with demonstrated understanding of the basic techniques of writing poetry.
BARRAX

ENG 495 Seminar in Writing-Editing. *Preq: Senior standing in LWE. 3(3-0) F,S.* Applies principles and experiences gained in previous study to practical problems and projects such as: document design and production, document testing, professional ethics, literacy education, and style analysis and evaluation.
COCKSHUTT, COVINGTON, HERNDL, C. MILLER, PENROSE

LITERATURE

The prerequisite for all courses in literature at the 200-level and above is the completion of ENG 111 and ENG 112.

ENG 205 Studies in Great Works of Literature.* *3(3-0) F,S,Sum.* Literary masterpieces from the classical period to the present. Emphasis on reading for understanding and enjoyment both of the works themselves and the cultural contributions to Western civilization of the periods from which the works are drawn.

ENG 206 Studies In Drama.* *3(3-0) F,S.* Selected drama from the classical period to the present. Emphasis on reading for enjoyment as well as understanding theory and development of tragedy, comedy, and other modes of dramatic expression.

ENG 207 Studies in Poetry.* *3(3-0) F,S.* Analysis of poetry and the critical approaches to it. Emphasis on appreciation of the nature of poetry, understanding features and techniques, and the importance of both historical context and new critical techniques.

ENG 208 Studies In Fiction.* *3(3-0) F,S,Sum.* Representative examples from the Renaissance to the present, emphasizing understanding and appreciation of fiction as a genre, a knowledge of the features and techniques of fiction, and a sense of the historical development of this genre.

ENG 209 Introduction to Shakespeare. *Does not satisfy requirements for English major. 3(3-0) F,S.* Shakespeare for non-English majors. Seven to ten major plays, including representative comedies, such as *The Taming of the Shrew*; histories, such as *Richard III*; tragedies, such as *Hamlet*; and romances, such as *The Tempest*.
BAINES, BLANK, LANE, WILLIAMS

ENG 248 Introduction to Black American Literature. *3(3-0) F,S.* Black American writing and relationships to American culture. Emphasis on modern autobiography, novel, short story, drama, poetry. Includes such writers as Baldwin, Ellison, Morrison, Walker, Malcolm X, Angelou, Wright, Baraka, Randall, and Reed.
HOLLOWAY, LARYEA, MacKETHAN, PETTIS

* The courses ENG 205, 206, 207, and 208 are designed for students not enrolled in Humanities and Social Sciences.

ENG 251 Major British Writers. *Credit will not be given for both ENG 251 and either ENG 261 or 262. 3(3-0) F,S,Sum.* Significant British authors chosen from among such figures as Chaucer, Shakespeare, Milton, Swift, Pope, Austen, Wordsworth, Coleridge, Tennyson, Browning, Bronte, Dickens, Joyce, Eliot, Woolf, and Yeats.

ENG 252 Major American Writers. *Credit will not be given for both ENG 252 and either ENG 265 or 266. 3(3-0) F,S,Sum.* Significant American authors chosen from among such figures as Franklin, Emerson Thoreau, Hawthorne, Melville, Douglass, Stowe, Whitman, Dickinson, Twain, James, Frost, Faulkner, Hemingway, and Morrison.

ENG 261 English Literature I. *3(3-0) F,S,Sum.* Survey of English literature from its beginnings until 1660, including such figures as Chaucer, Spenser, Marlowe, Shakespeare, Jonson, Donne, and Milton.

ENG 262 English Literature II. *3(3-0) F,S,Sum.* Survey of English literature from 1660 to the present, including such figures as Dryden, Pope, Swift, Johnson, Wordsworth, Coleridge, Byron, Keats, Shelley, Browning, Tennyson, Joyce and T.S. Eliot.

ENG 265 American Literature I. *3(3-0) F,S,Sum.* Survey of American literature from the Colonial beginnings until the Civil War, including such figures as Edwards, Franklin, Irving, Cooper, Hawthorne, Emerson, Melville, Poe and Thoreau.

ENG 266 American Literature II. *3(3-0) F,S,Sum.* Survey of American literature from the Civil War to the present, including such figures as Whitman, Dickinson, Twain, Crane, James, Frost, Eliot, Fitzgerald, Hemingway and Faulkner.

ENG 282 Introduction to Film. *3(2-2) F,S.* Examination of basic film techniques and basic methods of film analysis. Emphasis on understanding and appreciating film as a major art form. GOMEZ, GRIMWOOD, MORRISON

ENG 298 Special Projects in English. *1-3 F,S,Sum.* Faculty-guided independent study, or courses on special topics determined by departmental interest or need.

ENG 305 Women in Literature: Female Writers and Their Female Characters. *3(3-0) S.* Diverse images of women and cultural assumptions about women in nineteenth and twentieth century American and British literature by women writers. The female literary imagination as it pertains to female characters and issues particularly relevant to women. ORR, PETTIS, SEVERIN

ENG 346 Literature of the Western World I. *3(3-0) F.* Selections from English translations of the Old and New Testaments, Homer, Virgil, Dante, and other writers from the 8th century B.C. to the 14th century A.D. Emphasis on their influence on literature in English. GROSS, KNOWLES, SMOOT

ENG 347 Literature of the Western World II. *3(3-0) S.* Continental literary activity from the Renaissance to 1900. Renaissance writers such as Rabelais, Boccaccio, and Cervantes; moves to the work of neoclassical writers such as Moliere, Racine, and Voltaire; and concludes with writers such as Rousseau, Dostoevsky, and Tolstoy, who represent the various currents of style and thought that mark the beginning of the modern world. KNOWLES, RUDNER, SMOOT

ENG 349 African Literature in English. *3(3-0)S.* Anglophone literature in Africa. Emphasis on the relationship between the African world-view and literary production and the persistent trend by African writers to connect literature with politics. Writers such as Achebe, Ngugi, Soyinka, and Serote.

ENG 362 The British Novel of the 18th Century. *3(3-0) S.* Emphasizes major novelists such as Defoe, Richardson, Fielding, Sterne, and Austen. MOORE, WYRICK

ENG 363 The British Novel of the 19th Century. *3(3-0) F.* Emphasizes major novelists such as Dickens, Trollope, the Brontes, Eliot, and Hardy. HUSKEY, KING

ENG 369 American Novel of the 19th Century. *3(3-0) F.* Major novels illustrating the development of American fiction from Romanticism to Realism and Naturalism. Works by such writers as Brown, Cooper, Hawthorne, Stowe, Melville, Twain, Howells, James, Norris, Crane, Chopin, and Dreiser. KNOWLES, PRIOLI, WEST

ENG 371 The Modern Novel. *3(3-0) S.* This course examines background and pattern and analyzes major examples of the twentieth-century novel.
AMIRAN, E. CLARK, REYNOLDS, THOMPSON

ENG 372 Modern Poetry. *Preq: ENG 112. 3(3-0) S.* English and American poetry since 1900. Emphasis on major figures such as Yeats, Eliot, Frost, Stevens, Williams, and Auden. Comparison of modern poets with more contemporary, post-1950 poets.
BASSETT, REYNOLDS, SEVERIN

ENG 376 Science Fiction. *3(3-0) F,S.* Representative works of science fiction. Emphasis on works written in the twentieth century, with some attention to the history and development of the genre. KESSEL, MEYERS

ENG 377 Fantasy. *3(3-0) F,S.* A study of representative works in the genre of Fantasy. Emphasis is placed on those works written in the nineteenth and twentieth centuries, although some attention is given to the history and development of the genre.
KESSEL, MEYERS

ENG 380 Modern Drama. *3(3-0) F.* Major plays from Ibsen to Albee.
HARGRAVE

ENG 382 Film and Literature. *3(2-2) F.* Ways of adapting literary works to film form. Similarities and differences between these two media. Emphasis on the practical art of transforming literature into film. Attention to the impact of film upon literature.
GOMEZ, MORRISON

ENG 385 Biblical Backgrounds of English Literature. *3(3-0) F. Alt. yrs.* Influences of the Bible—principal forms, genres, and texts—on major English and American writers such as Milton, Spenser, Melville, Eliot, and Faulkner. WALL

ENG 390 Classical Backgrounds of English Literature. *3(3-0) S.* Acquaints student with the central story-matter, classical and biblical, of the ancient Western world. Emphasis on works most influential on literature in English. All reading in English. YOUNG

ENG 391 Introduction to American Folklore. *3(3-0) S.* Principal types of folklore, combined with field work in collecting and assimilating materials from various cultural traditions. Emphasis on American folklore and its origins. BETTS, HUSKEY, PRIOLI

ENG 398 Contemporary Literature I (1900 to 1940). *3(3-0) F.* Imaginative literature from the period 1900-1940 with emphasis upon themes and techniques rather than genre or nationality. AMIRAN, E. CLARK, GRIMWOOD, THOMPSON, UNSWORTH

ENG 399 Contemporary Literature II (1940 to Present). *3(3-0) S.* Representative French, American, and British writers of the period 1940 to the present.
AMIRAN, GRIMWOOD, RUDNER, THOMPSON, UNSWORTH

ENG 400 Applied Criticism. *Preqs: Major in LTN; senior standing; formal admission to the methods and student teaching courses; Coreq: ED 450. 3(3-0) F.* Types and methods of literary criticism designed specifically for students intending to teach English in high school. BETTS, MACKETHAN

ENG (ECI) 405 Literature for Adolescents. *Preq: Junior standing or above. 3(3-0) F.* The history, types, and characteristics of literature for adolescents. Emphasizes reading and analyzing the literature by exploring the themes, literary elements, and rationale for teaching literature for adolescents. Addresses ways in which this literature can be integrated and implemented in English/Language Arts curriculum.

ENG 439 17th Century English Literature. *3(3-0) S.* Works of major nondramatic literary figures in England during the period 1600-1700, such as Donne, Jonson, Herbert, Marvell, Bacon, and Browne. HESTER, WALL, YOUNG

ENG 449 16th Century English Literature. *3(3-0) F.* Nondramatic prose and poetry of the sixteenth century, with consideration of literary types and movements. Emphasis on major authors, including Sidney and Spenser. BLANK, HESTER, LANE, WALL

ENG 451 Chaucer. *3(3-0) F,S.* Introduction to the study of Chaucer through an intensive reading of The Canterbury Tales and Troilus and Criseyde.
FERSTER, GROSS, HOLLEY, LOMPERIS

ENG 453 The Romantic Period. *3(3-0) F.* Emphasis on the major poetry of Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats, with readings in Romantic prose.
HARRISON, HERNDL, D. MILLER

ENG 462 18th Century English Literature. *3(3-0) F.* The major figures in English literature between 1660 and 1790 in the light of social, cultural, and religious change.
DURANT, MOORE, WYRICK

ENG 463 The Victorian Period. *3(3-0) S.* Major British poets and selected prose writers studied against the social, economic, scientific, and theological background of the Victorian Period.
HARGRAVE, HARRISON, HUSKEY, KING

ENG 468 American Romanticism. *3(3-0) F.* Major American writers from 1825 to 1865.
E. CLARK, PRIOLI, SMALL, STEIN, WEST

ENG 469 American Realism and Naturalism. *3(3-0) S.* Major American writers from 1865 to 1935.
E. CLARK, J. CLARK, ORR, STEIN, WEST

ENG 486 Shakespeare, The Earlier Plays. *3(3-0) F.* Shakespeare's major works before 1600 with emphasis on the development of the playwright.
BAINES, BLANK, CHAMPION, WILLIAMS

ENG 487 Shakespeare, The Later Plays. *3(3-0) S.* Shakespeare's major works after 1600 with emphasis on the development of Shakespeare's tragedy and the end of his career.
BAINES, BLANK, CHAMPION, WILLIAMS

ENG 491 Honors in English. *Preq: Open only to English majors. 3(3-0) F,S.* Intensive course or independent study project designed as one portion of the Honors Program in English. Subject varies.

ENG 492 Special Topics in Film Styles and Genres. *3(2-2) S.* Critical approaches to focused film topics involving film genres, directorial styles, or trends within a national cinema. Topics will vary from semester to semester.

ENG 496 Seminar in Literary Criticism. *Preq: 9 hours of literature at the 300 level or above. 3(3-0) F,S.* Introduction to theoretical and applied criticism of literature, primarily for English majors and minors. May include traditional theory from Plato and Aristotle to New Criticism, as well as contemporary psychoanalytical, social, historical, and linguistic approaches to literature.

ENG 498 Special Topics in English. *Preq: Six hours in ENG above the fr. level. 1-6 F,S,Sum.* Directed individual study of experimental course offerings in language or literature. As individual study, arranged through consultation with faculty member and department head.

Selected 500-Level Courses Open To Advanced Undergraduates

The prerequisite for all 500-level English courses is advanced undergraduate or graduate standing unless additional prerequisites are noted.

ENG 515 American Colonial Literature. *3(3-0) S. Alt. yrs.*

ENG 524 Introduction to Linguistics. *3(3-0) F.*

ENG 525 Variety in Language. *3(3-0) S.*

ENG 548 Black American Literature. *3(3-0) F.*

ENG 561 Milton. *3(3-0) S.*

ENG 575 Southern Writers. *3(3-0) S.*

ENG 578 English Drama to 1642. *Preqs: ENG 261. 3(3-0) Alt. F.*

ENG 579 Restoration and 18th-Century Drama. *3(3-0) Alt. S.*

ENTOMOLOGY

ENT 203 An Introduction to the Honey Bee and Beekeeping. *2(2-0) F.* Fundamental knowledge of beekeeping management and a general understanding of the honey bee's biology. Examines the behavior and social system of the honey bee, one of the animal world's most complex and highly organized non-human societies. AMBROSE

ENT 301 Introduction to Forest Insects. *Preq: FOR 264. 3(2-2) F.* Fundamentals of morphology, classification, development, habits and control of insects attacking trees with emphasis on those injuring forests in the southeastern United States. FARRIER

ENT 312 Introduction to Economic Entomology. *Preq: BS 100. 3(2-2) F,S.* A practical introduction to the science of entomology, including systematics, morphology, physiology, ecology, and management of insect and mite species of economic importance. A collection of economically important species is required. Major emphasis is on the principles of insect pest management. STAFF

ENT (ZO) 425 General Entomology. *Preq: ZO 201. 3(2-3) F,Sum.* The science of entomology by focusing on the basic principles of systematics, morphology, physiology, development, behavior, ecology, and control of insects. Field trips provide opportunities to collect insects and study their adaptations to a wide variety of natural environments. MEYER

ENT 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

ENT 493 Special Problems in Entomology. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

ENT 495 Special Topics in Entomology. *1-3 F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

Selected 500-Level Courses Open To Advanced Undergraduates

ENT 502 Insect Diversity. *Preq: ENT 425 or equivalent. 4(2-4) F.*

ENT 503 Functional Systems of Insects. *Preqs: Twelve hours of biology, nine hours of CH. 4(3-3) S.*

ENT (ZO) 509 Ecology of Stream Invertebrates. *Preqs: ZO 201 or 302, BO (ZO) 360 or equivalent. 4(2-6) S.*

ENT 520 Insect Pathology. *Preqs: Introductory entomology and introductory microbiology. 3(2-3) Alt. S.*

ENT 541 Immature Insects. *Preq: ENT 502 or equivalent. 3(1-4) Alt. F.*

ENT 550 Fundamentals of Insect Control. *Preq: ENT 312 or 301. 3(2-2) F.*

ENT (FOR) 565 Advanced Forest Entomology. *Preq: ENT 301 or ENT 502 or CI. 3(2-2) Alt. S.*

ENT (ZO) 582 Medical and Veterinary Entomology. *Preqs: ENT 301 or 312 and ZO 315 or equivalent. 3(2-3) Alt. S.*

ENT 590 Special Problems. *Preq: CI. Credits Arranged. F,S.*

ENT 591 Special Topics. *Preq: CI. Credits Arranged, F,S.*

OCCUPATIONAL EDUCATION

EOE 101 Introduction to Occupational Education. *1(1-0) F,S.* Orientation to occupational teacher education curricula. Overview of philosophy, objectives and scope of occupational education programs in the public schools; multi-cultural and individual differences of students. Orientation to microcomputers and their potential uses by occupational education teachers. MOORE

EOE 207 Introduction to Teaching Occupational Education. *3(2-3) F.* Introduction to teaching vocational education programs in middle and secondary schools. Field experiences and course assignments including three hours each week assisting classroom teachers in the public schools.

EOE 226 Applications of Instructional Technology in Agricultural Education. *3(1-4) S.* Use of microcomputers and commercially produced agricultural software; the microcomputer as a management tool; agricultural occupational applications of the microcomputer; the microcomputer as an instructional tool in agricultural classrooms; and the national Agri Data network. MALPIEDI-KIRBY

EOE 241 Foundations of Marketing Education. *2(2-0) F.* An introduction to Marketing Education and its role in secondary, postsecondary, and adult education. BURROW

EOE 302 Occupational Survival Skills for the Workplace of the Future. *Preq: Sophomore standing. 3(3-0) F.* Overview of the nature of work and the workplace of the future. Focuses specifically on the skills necessary for successful participation in a number of fields. Alternative career ladders and personal learning plans are explored. DILLON

EOE 303 Administration and Supervision of Student Organizations. *Preq: Sophomore standing. 3(3-0)* History and purposes of student organization activities in education. Emphasis on the administration and supervision of these activities. Special attention to the skills necessary for the successful organization, management and leadership development of student activities.

EOE 307 Field Work in Occupational Education. *Preqs: Sophomore standing and consent of instructor. May be repeated to a maximum of 6 credits. 2-6. F,S,Sum.* A supervised off-campus field experience in Occupational Education that relates on-the-job experiences in the field to the technical competencies which are the content of the curriculum.

EOE 322 Contemporary Vocational Agriculture. *3(3-0) S.* Organizing, implementing, supervising, and evaluating Supervised Occupational Experience (SOE) programs and related FFA activities; advising local FFA chapters; and assisting high school students in conducting SOE programs. MALPIEDI-KIRBY

EOE 323 Leadership Development in Agriculture. *3(3-0) S.* Study of leadership in agricultural and related settings. JEWELL

EOE 331 Survey of the Health Occupations. *3(3-0) S.* An examination of key occupations and professions in the health cluster. Emphasis is on educational preparation, requirements for practice, potential advancement, inter and intra professional relationships, ethical foundations of practice, and the concept of commitment. Theoretical concept of role structure and function. PATTERSON

EOE 332 Problems in Health Education. *3(3-0) S.* Emphasis on education of the public regarding general health concerns including cancer, cardiovascular disease, accident prevention, nutrition, drugs, alcohol, mental health, sexuality, and environmental hazards. PATTERSON

EOE 336 Strategies of Teaching a Health Occupation. *Preqs: PSY 304. 3(3-0) F.* Planning and implementation of instructional strategies for clinical and classroom settings. Focus on the development of competencies for effectively implementing a curriculum in a health occupation. The nature of the teaching/learning process, psychological and philosophical aspects of teacher choice of various strategies will be examined. AKROYD

EOE 346 Curriculum and Methods of Teaching Marketing Education. *Preq: EOE 241 and admission to teacher education candidacy. 3(3-0) F Alt. yrs.* Study of the curriculum common to Marketing Education programs and the research behind its development. Methods common to instructional planning, implementation, and evaluation of effective marketing education programs. BURROW

EOE 365 Trade Analysis in Course Development. *Preq: EOE 101. 3(3-0) S.* Selection and analysis of teaching activities for a functional plan of instruction. Development of instructional units based on analysis of a trade or technical occupation or activity. Preparation of a detailed course of study. FARMER

EOE 404 Principles and Practices of Cooperative Vocational Education. *Preq: Admission to Teacher Education candidacy. 3(2-2).* Principles, objectives, operation and evaluation of cooperative programs in Vocational Education focusing on the role and duties of teacher-coordinators.

EOE 409 Honors Seminar in Occupational Education. *Preq: Permission of instructor. 1(1-0) F.* Topics of professional importance for occupational education honors program students. Presentations on a wide range of seminar topics and their implications for occupational education. MOORE

EOE 422 Public Relations in Agriculture. *Preq: AC 311. 3(3-0) F.* Development of effective public relations programs in agricultural and related occupations. Examination of problems in implementation and of communication skills needed to conduct effective public relations activities. FLOWERS

EOE 423 Practicum in Agricultural Extension/Industry. *Preqs: EOE 426, Senior standing and consent of instructor. 1-8 S.* Supervised practicum in an agricultural extension or industry setting in which the student participates in, and analyzes activities associated with, preparing for leadership/management roles in the Agricultural Extension Service or industry. JEWELL

EOE 424 Planning Educational Programs. *Preq: Admission to Professional Semester. 3(3-0) S.* Principles of program planning applied to educational programs in agriculture; includes theory and field experiences in planning, organizing, and evaluating high school and adult education programs.

EOE 426 Methods of Teaching Agriculture. *Preq: Jr. standing. 3(2-2) F.* Discussion and practice in planning and presenting instruction in agriculture in formal and informal settings. Focus on principles and application of approaches to teaching and organizing instruction, motivating students, developing instructional objectives, selecting and using teaching techniques, evaluating instruction, and managing classroom and laboratory instruction. FLOWERS

EOE 427 Student Teaching in Agriculture. *Preqs: EOE 426, admission to Professional Semester; Coreqs: EOE 424, EOE 492. 8(2-15) S.* Skills and techniques involved in teaching vocational agriculture through practice in a public school setting with concurrent on-campus seminars. FLOWERS

EOE 433 Health Occupations Specialty Practicum. *Preq: Current credential in a recognized health discipline. 6 Arranged.* Provides prospective teachers an opportunity to acquire new content and depth in their particular health discipline. The requirements may be fulfilled by a combination of advanced course work related to the speciality and through individually designed practicums. The practicum will be arranged in an appropriate health care environment with selected and qualified preceptors.

EOE 436 Evaluative Skills of Teaching a Health Occupation. *Preq: EOE 336. 3(3-0) S.* Formative and summative evaluation of curriculum, instruction, learning, and clinical performance. Attention is devoted to analysis of existing instruments/designs for clinical evaluation with respect to validity and reliability. Students will acquire skills in the development of instruments to evaluate clinical performance and the construction of test items. AKROYD

EOE 437 Health Occupations Teaching Practicum. *Preqs: EPL 344, EOE 331, 336, 436, PSY 304, and admission to teacher education. For Health Occupations Education Majors only. Coreq: PSY 476. 8(3-15) S.* Practical teaching experience to integrate the skills and techniques of teaching a health occupation. Through cooperation with health occupations programs in hospitals, community colleges, technical institutes and secondary schools, a teaching practicum in the student's specific health discipline will be arranged.

EOE 444 Administration of Marketing Education. *Preqs: EOE 241 and admission to teacher education candidacy. 3(3-0) F. Alt. yrs.* The theory and skills necessary to plan, administer, and evaluate effective programs in Marketing Education. Emphasis on classroom management skills and coordination of cooperative education. BURROW

EOE 447 Student Teaching in Marketing Education. *Preq: Admission to professional semester; Coreq: EOE 494. 8(2-15) S.* Provides prospective teachers the opportunity to develop the skills and techniques required in the Marketing Education classroom. Student teachers spend ten weeks full-time in a public school: observing, teaching, and participating in the total school program. BURROW

EOE 452 Technology Education. *Preq: Admission to professional semester; Coreq: ED 473 and ED 492. 3(1-4) S.* Knowledge and experience about industrial arts laboratory planning are provided. Physical layout, selection, specification, and cost of equipment; the safe operation, repair and maintenance of both power and hand tools; specification of expendable supplies, estimating, and ordering.

EOE 456 Curriculum and Methods in Technology Education. *Technology Education majors only. 3(2-2) F.* Methods of teaching technology education. Emphasis on curriculum development, instructional methods, laboratory instruction, meeting the needs of special populations, and management of student organizations.

EOE 457 Student Teaching in Technology Education. *Preq: Admission to professional semester; Coreqs: EOE 452 and EOE 495. 3-8 S.* Students participate in off-campus student teaching in selected public schools, acquiring competencies for teaching industrial arts and familiarity with the total context in which the Industrial Arts Education program occurs. WENIG

EOE 466 Methods of Teaching Vocational Industrial/Technical Education. *Preq: Admission to Teacher Education candidacy. 3(3-0) F.* Methods and techniques of teaching industrial subjects: preparation of lesson plans, techniques of presentation, use of teaching aids and materials, class organization, shop safety and evaluation. FARMER

EOE 467 Student Teaching in Vocational Industrial Education and Technical Education. *Preq: Admission to Professional Semester. 8(2-15) S.* Experience in the techniques and skills involved in teaching vocational industrial/technical education curricula. Full-time, off-campus teaching in selected schools. Introduction to the total operation of a school program with cooperative industries in the community.

EOE 481 Introduction to Training and Development. *3(3-0) F.* Overview of the field of training and development. Discussion of roles common to practitioners across the broad field of human resource development including management and developmental concerns. Methods and techniques common to industry training programs. DILLON

EOE 492 Senior Seminar in Agricultural Education. *Admission to Professional Semester. 1-3 S.* Analysis of opportunities and problems facing educational leaders in agriculture with emphasis upon current problems. JEWELL

EOE 494 Senior Seminar in Marketing Education. *Preq: Admission to professional semester; Coreq: ED 438. 3(3-0) S.* Marketing Education majors analyze and discuss problems and successes experienced while student teaching in the public schools.

EOE 495 Senior Seminar in Technology Education. *Preqs: Junior standing in Ed. and consent of the department. 1-3. F,S.* An in-depth investigation of a topic or a set of problems and/or issues in Industrial Arts Education.

EOE 496 Senior Seminar in Industrial and Technical Education. *Preq: Sr. standing in VIE or TED. 1-3 S.* Discussion and analysis of various problems and issues of importance and interest to student teachers and other future professionals in Industrial and Technical Education.

EOE 498 Special Topics in Education. *Preq: Junior or senior standing and consent of instructor. 1-3.* Individual or group study of special topics in professional education. The topic and mode of study are determined by the faculty member after discussion with the student.

FOREIGN LANGUAGES AND LITERATURES

(See also GRK—Greek and LAT—Latin.)

NOTE: Courses conducted in the target language, except where otherwise stated.

NOTE: Students with previous knowledge of French, German, Latin, or Spanish must take the placement test upon entering the University. They will be given advanced standing and receive credit according to their score, as follows.

Students completing with a C or better any course in which they are placed beyond the 101 level will receive credit for prerequisite courses to a maximum of 6 hours. Students who place beyond the requirement in their curriculum and choose not to take a foreign language course will have satisfied the foreign languages requirement but will not receive hour credit. Students transferring college credits should enroll at the level for which they have met the prerequisite.

Native speakers do not receive credit for lower division courses (100 and 200 levels) in their mother tongue.

FL 101 Elementary Language I. *Preq: Consent of coordinator. 3(3-0) F.* Self-instructional study of a foreign language, not otherwise taught in the department. Admission by interview with coordinator before registering. First of a sequence of four courses.

FL 102 Elementary Language II. *Preq: Consent of coordinator. 3(3-0) S.* Self-instructional study of a foreign language, not otherwise taught in the department. Admission by interview with coordinator before registering. Second of a sequence of four courses.

FL 201 Intermediate Language I. *Preq: Consent of coordinator. 3(3-0) F.* Self-instructional study of a foreign language, not otherwise taught in the department. Admission by interview with coordinator before registering. Third of a sequence of four courses.

FL 202 Intermediate Language II. *Preq: Consent of coordinator. 3(3-0) S.* Self-instructional study of a foreign language, not otherwise taught in the department. Admission by interview with coordinator before registering. Fourth of a sequence of four courses.

FL 260 Linguistics for Teachers of Second Languages. *3(3-0)* Introduction to scientific study of language, specially adapted to the needs of language teachers. Emphasis on structure of language (phonology, morphology, syntax, and semantics), and contrasting language structures. Treatment of animal language, first and second language acquisition, language change and variation, linguistic pluralism, and the universals of language.

FL 295 Special Topics in Foreign Languages and/or Literatures. *Preq: Consent of department. 3(3-0).* A special projects course on topics to be determined as needed in the departmental program.

FL 298 Independent Study in Foreign Language or Literature. *Preq: Consent of department. 1-3 F,S.* Individualized study in a foreign language or literature. Topic, mode of study and credit hours to be determined in consultation with the faculty member supervising work.

FL 350 Modern European Literary Criticism. *Preq: 6 hours of any 300 level literature courses. 3(3-0).* Study of theoretical and philosophical foundations and applied methods in major currents of modern European literary criticism. Includes structuralism, post-structuralism, feminism, and psychoanalytical and ideological criticism. Examination of critical works and application to literary texts. Course taught in English.

FL 495 Special Topics in Foreign Languages and Literatures. *Preq: Consent of department. 3(3-0).* A concentrated study of a special period, author or genre to be determined as needed in the departmental program.

FL 498 Independent Study in Foreign Language or Literature. *Preq: Consent of department. 1-6.* Individualized study of a foreign language or literature. Topic, mode of study, and credit hours to be determined in consultation with the faculty member supervising work.

CHINESE LANGUAGE AND LITERATURE

FLC 101 Elementary Chinese I. *3(3-0) F.* Introduction to Modern Standard Chinese. Emphasis on speaking and listening with an introduction to reading, writing and Chinese culture.

FLC 102 Elementary Chinese II. *Preq: FLC 101. 3(3-0) S.* Continuation of basic skills. Emphasis on speaking and listening with some reading, writing and Chinese culture.

FLC 105 Intensive Elementary Chinese. *6(6-0) F.* Intensive introduction to Modern Standard Chinese. Emphasis on speaking and listening with an introduction to reading, writing and Chinese culture.

FLC 201 Intermediate Chinese I. *Preq: FLC 102. 3(3-0) F.* Continuation of basic skills. Greater emphasis on reading, writing and Chinese cultural traditions.

FLC 202 Intermediate Chinese II. *Preq: FLC 201. 3(3-0) S.* Continuation of basic skills. Focus on reading, writing, Chinese cultural traditions and patterns of behavior.

FLC 301 Intermediate Chinese III. *Preq: FLC 202. 3(3-0) F. Alt. yrs.* Last of the foundation courses in Chinese. Continued practice in speaking and understanding Chinese with new emphasis on writing and on the reading of cultural and literary texts.

FLC 302 Intermediate Chinese IV. *Preq: FLC 301. 3(3-0) S. Alt. yrs.* Continued practice in speaking and understanding Chinese with greater emphasis on reading and writing. Continued study of cultural and literary texts.

ENGLISH FOR FOREIGN STUDENTS

NOTE: Undergraduate students in the following schools do not receive free elective credit for the successful completion of Foreign Language English courses, (FLE 101, 102, 103, 104): School of Design, School of Education, School of Engineering, School of Physical and Mathematical Science, and School of Textiles. Credits for the FLE courses received by students in those schools will be recorded on grade reports and transcripts and will be used in GPA calculations, but these credits will not count as part of the hours required for graduation. Students in the School of Agriculture and Life Sciences, the School of Forest Resources, and the School of Humanities and Social Sciences receive free elective credit towards graduation for successful completion of any of the FLE courses.

FLE 101 Foreign Language English: Grammar Review. *Preq: Scores between 500 and 575 on the TOEFL Test; Coreq: Michigan Test of English Language Proficiency and Michigan Test of Aural Comprehension. Open only to non-native speakers of English. 3(3-0) F,S.* Review of English grammar with emphasis on word order patterns, idioms, and function words of spoken American English; oral drill on statement and question patterns in all tenses; and practice in constructing original patterns. Language laboratory practice required.

FLE 102 Foreign Language English: Writing. *Preq: Scores between 500 and 575 on the TOEFL Test; Coreq: Michigan Test of English Language Proficiency and Michigan Test of Aural Comprehension. Open only to non-native speakers of English. 3(3-0) F,S.* Practice in writing sentences, paragraphs, summaries, outlines, and compositions. Drills on mechanics: spelling, punctuation, capitalization, and apostrophes. Exercises on use of transitional words, quotation and subordination to indicate relationships. Analysis and imitation of

well-written paragraphs to learn logical organization, coherence, and unity. Formal compositions written in class and informal journals written outside class.

FLE 103 Foreign Language English: Oral English. *Preq: Scores between 500 and 575 on the TOEFL Test; Coreq: Michigan Test of English Language Proficiency and Michigan Test of Aural Comprehension. Open only to non-native speakers of English. 3(3-0) F,S.* Designed for students who need additional oral English practice in order to comprehend spoken English and be understood by native speakers. Emphasis on correct pronunciation and intonation and the use of colloquial expressions and speech patterns. Aural comprehension exercises, oral drills to practice idiomatic English and functional (survival) vocabulary, role playing, class discussions, films, and language laboratory practice.

FLE 104 Foreign Language English: Reading Improvement. *Preq: Scores between 500 and 575 on the TOEFL Test; Coreq: Michigan Test of English Language Proficiency and Michigan Test of Aural Comprehension. Open only to non-native speakers of English. 1(0-3) S.* Designed for students who need to improve reading speed and comprehension in order to read efficiently in other courses. Concept of class as a reading lab with timed drills and materials to give students practice in responding rapidly and accurately to increasingly longer units of reading matter. Technique of scanning, dictionary and vocabulary-building exercises.

FRENCH LANGUAGE AND LITERATURE

FLF 101 Elementary French I. *3(3-0) F,S,Sum.* First in a four-course sequence to develop language skills. Oral and written practice in classroom and language laboratory. Readings in French culture and civilization.

FLF 102 Elementary French II. *Preq: FLF 101. 3(3-0) F,S,Sum.* Continuation of FLF 101 with intensive practice in spoken French. Readings in French culture and civilization.

FLF 105 Intensive Elementary French. *6(6-0) F.* An intensive course aimed at developing a balanced foundation in listening, speaking, reading, and writing French. Equivalent to FLF 101 plus FLF 102.

FLF 201 Intermediate French I. *Preq: FLF 102. 3(3-0) F,S,Sum.* Third of four consecutive courses to develop skills of speaking, listening, reading and writing. Readings and discussions of French culture, civilization and literature.

FLF 202 Intermediate French II. *Preq: FLF 201. 3(3-0) F,S.Sum.* Last of four sequential language courses. Increased emphasis on reading and writing. Readings in the literature, culture, and civilization of France and the francophone world.

FLF 208 Intermediate French Conversation. *Preq: FLF 201. 3(3-0) F.* Intensive practice in speaking and understanding French through role playing, debates, interviews and use of audio-visual materials.

FLF 301 Survey of French Literature to 1800. *Preq: Any of the following: FLF 308, 310, 311 or 315. 3(3-0) F.* Literature of the French Middle Ages, French Rennaissance, Classicism and Enlightenment; special attention to genre development. Readings of representative works with analytical and critical emphasis.

FLF 302 Survey of French Literature Since 1800. *Preq: Any of the following: FLF 301, 308, 310, 311, 315. 3(3-0) S.* French Romanticism, Realism, Symbolism, Surrealism, Existentialism, and modern literary experimentation. Readings of representative works with analytical and critical emphasis.

FLF 307 Technical and Commercial French. *Preq: FLF 202. 3(3-0) F.* Conversational and written French with emphasis on technical and commercial materials.

FLF 308 French Conversation and Reading. *Preq: FLF 202. 3(3-0) S.* Intensive practice in speaking and reading French. Drills and conversation emphasizing practical language and idiomatic expressions.

FLF 309 French Phonetics and Pronunciation. *Preq: FLF 202. 3(3-0) F., Alt. yrs.* A study of the production of the sounds of Standard French with the aim of improving pronunciation and fluency. Extensive oral practice in major problem areas.

FLF 310 French Syntax and Composition. *Preq: FLF 202. 3(3-0) S.* A thorough study of the more advanced aspects of the grammar of the French language, with extensive practice in writing.

FLF 311 Methods and Techniques in French Translation. *Preq: FLF 202. 3(3-0) F, Alt. yrs.* Methods and techniques in translation with an emphasis on writing skills.

FLF 315 French Civilization and Culture. *Preq: FLF 202. 3(3-0) S. Alt. yrs.* French civilization and culture, through reading, discussion and presentation of the social, economic and political structures of France, along with its geography, history, music and art. Taught in French.

FLF 316 French Lyric Poetry. *Preq: FLF 202. 3(3-0) S, Every 3rd yr.* Development of the French lyric genre from the origins to the present, including the rules and practices of French versification.

FLF 323 The French Novel of the Twentieth Century. *Preq: FLF 202. 3(3-0) F. Alt. yrs.* Survey of the 20th century French novel. Works of Gide, Proust, Mauriac, Malraux, Sartre and Camus and representative novels of surrealism, existentialism, and the "new novel".

FLF 324 Contemporary French Theater. *Preq: FLF 202. 3(3-0) F, Every 3rd yr.* Representative playwrights of twentieth-century France, including Giraudoux, Anouilh, Sartre, Beckett, Ionesco, and Genet.

FLF 352 Francophone Culture of West Africa and the Caribbean. *Preq: FLF 202. 3(3-0) S, Alt. yrs.* Literary and cultural traditions of French-speaking West Africa and the Caribbean. Taught in French.

FLF 414 Masterpieces of French Prose. *Preq: FLF 202. 3(3-0) F. Alt. yrs.* French prose from the Renaissance to 1900.

FLF 415 French Theater To 1900. *Preq: FLF 202. 3(3-0) S, Every 3rd yr.* Reading and discussion of representative French plays, including a study of tragedy, comedy, farce, and drama. Authors include Corneille, Racine, Moliere, Lesage, Marivaux, Sedaine, Beaumarchais and Musset.

FLF 492 Seminar in French Studies. *Preq: Junior standing and consent of department. 3(3-0) S. Alt. yrs.* A small-group study of a topic in literature resulting in either a substantial essay or series of essays by each student. Topics vary each semester.

GRADUATE CERTIFICATION ONLY

FLF 401 French for Graduate Students. *Preq: Graduate standing. Not open to undergraduates. 3(3-0) F.* Basic French grammar, with special attention to characteristics of formal expository style, and illustrative readings. Study of extracts from scholarly publications in the students' areas of research. Graduate language certification granted on satisfactory completion of the course.

GERMAN LANGUAGE AND LITERATURE

FLG 101 Elementary German I. *3(3-0) F,S,Sum.* The first in a four-course sequence intended to teach the student to understand, speak, read and write everyday German. Emphasis on speaking and understanding with additional reading of cultural materials. Intensive practice in the language lab.

FLG 102 Elementary German II. *Preq: FLG 101. 3(3-0) F,S,Sum.* Strong emphasis continued on understanding and speaking German, but increasing attention to syntax, vocabulary building, and awareness of cultural heritage of the German-speaking countries.

FLG 201 Intermediate German I. *Preq: FLG 102. 3(3-0) F,S,Sum.* The third of four consecutive courses in German. Intensive conversational drill to build the students' ability to understand and speak everyday German. Supplementary readings in German literature and culture.

FLG 202 Intermediate German II. *Preq: FLG 201. 3(3-0) S.* Last of four sequential courses in German. Continued use of everyday spoken German but greater emphasis on reading and writing. Additional readings in German literature and culture.

FLG 208 Intermediate German Conversation. *Preq: FLG 201. 3(3-0) S.* Intensive practice in speaking and understanding German through role playing, debates, interviews and use of audio-visual materials.

FLG 307 Technical and Commercial German. *Preq: FLG 202. 3(3-0) F.* Conversational and written German with emphasis on technical and commercial materials.

FLG 309 Advanced German Conversation and Phonetics. *Preq: FLG 202. 3(3-0) F.* Intensive conversational practice in class and language laboratory based on current topics, and a study of sound production and linquistic terminology. Discussions of German culture and civilization. Attention to cultural factors essential to effective communication. Oral reports by students.

FLG 310 Advanced German Syntax and Composition. *Preq: FLG 202. 3(3-0) F. Alt. yrs.* Advanced aspects of German syntax and writing styles. Assignments include paraphrasing and summarizing authentic German texts and writing compositions.

FLG 315 Germanic Civilization and Culture. *Preq: FLG 202. 3(3-0) S.* Culture and civilization of the German-speaking countries. Analysis of the social, economic and political structures of the two Germanies, Austria, and Switzerland. Lectures, reports, conversation. Taught in German.

FLG 316 German Lyric Poetry. *Preq: FLG 202. 3(3-0) S, Every 3rd yr.* Historical and interpretative study of the German lyric from the fifteenth to the twentieth century.

FLG 323 Twentieth Century German Literature. *Preq: FLG 202. 3(3-0) S, Every 3rd yr.* Twentieth century literature from German-speaking countries. Readings of Mann, Kafka, Rilke, Hesse, Dürrenmatt, Frisch, Grass, and a variety of poets.

GRADUATE CERTIFICATION ONLY

FLG 401 German for Graduate Students. *Preq: Graduate standing; Not open to undergraduates. 3(3-0) F.* Basic German grammar, with special attention to characteristics of formal expository style, and illustrative readings. Study of extracts from scholarly publications in the students' areas of research. Graduate language certification granted on satisfactory completion of the course.

HEBREW LANGUAGE AND LITERATURE

FLH (REL) 101 Elementary Biblical Hebrew I. *3(3-0) F.* (See Religion.)

FLH (REL) 102 Elementary Biblical Hebrew II. *Preq: REL (FLH) 101. 3(3-0) S.* (See Religion.)

FLH (REL) 201 Intermediate Biblical Hebrew I. *Preq: REL (FLH) 102. 3(3-0) F.* (See Religion.)

FLH (REL) 202 Intermediate Biblical Hebrew II. *Preq: REL (FLH) 201. 3(3-0) S.* (See Religion.)

ITALIAN LANGUAGE AND LITERATURE

FLI 101 Elementary Italian I. *3(3-0) F.* Begins the development of a balanced foundation in all four language skills. Concentrates on listening and speaking, emphasizing idiomatic Italian. Short readings in Italian culture and civilization. Class and laboratory practice, written homework.

FLI 102 Elementary Italian II. *Preq: FLI 101. 3(3-0) S.* Continuation of FLI 101 with emphasis on acquisition of oral skills through class practice and use of audio aids. Readings in Italian culture, civilization and literature.

FLI 201 Intermediate Italian I. *Preq: FLI 102. 3(3-0) F.* Third of four consecutive courses to develop skills of speaking, listening, reading and writing. Readings and discussion of Italian culture, civilization and literature.

FLI 202 Intermediate Italian II. *Preq: FLI 201. 3(3-0) S.* Last of four sequential language courses. Increased emphasis on reading and writing. Readings in the literature, culture, and civilization of Italy.

FLI 208 Intermediate Italian Conversation. *Coreq: FLI 201. 3(3-0).* Intensive practice in speaking and understanding Italian through role playing, discussion, interviews, and use of audio-visual materials.

FLI 308 Italian Reading and Conversation. *Preq: FLI 201. 3(3-0).* Advanced readings and intensive conversational practice in Italian for students beyond the intermediate level.

JAPANESE LANGUAGE AND LITERATURE

FLJ 101 Elementary Japanese I. *3(3-0) F.* Introduction to standard, formal Japanese. Emphasis on speaking and listening skills. Exposure to Japanese culture, reading, and writing.

FLJ 102 Elementary Japanese II. *Preq: FLJ 101. 3(3-0) S.* Continuation of basic skills. Emphasis on speaking and listening skills; inclusion of Japanese cultural factors in communication. Some reading and writing.

FLJ 103 Elementary Japanese I Conversation. *Coreq: FLJ 101. 1(1-0) F.* Supplements conversational practice in FLJ 101. Students are encouraged to use their speaking skills in a variety of situations. Special attention is given to correcting and improving pronunciation and intonation.

FLJ 104 Elementary Japanese II Conversation. *Preq: FLJ 101; Coreq: FLJ 102. 1(1-0) S.* Supplements conversational practice in FLJ 102. Students are encouraged to use their speaking skills in a variety of situations. Special attention is given to correcting and improving pronunciation and intonation.

FLJ 105 Intensive Elementary Japanese. *6(6-0) F,Sum.* An intensive introduction to standard, formal Japanese. Emphasis is on speaking and listening skills. Some reading and writing. Combines FLJ 101 and 102.

FLJ 201 Intermediate Japanese I. *Preq: FLJ 102 or FLJ 105. 3(3-0) F.* Continuation of basic skills. Greater emphasis on reading and writing. More exposure to Japanese cultural traditions.

FLJ 202 Intermediate Japanese II. *Preq: FLJ 201. 3(3-0) S.* Continuation of the learning of the basic skills. Emphasis on reading and writing as well as on spoken Japanese and on cultural patterns of behavior.

FLJ 203 Intermediate Japanese Conversation. *Preq: FLJ 102; Coreq: FLJ 201, FLJ 202 or FLJ 301. May be repeated to a maximum of three credit hours. 1(1-0) F,S.* Practice in spoken Japanese through use of the language in a variety of situations. Increase vocabulary and develop fluency and ease in the structural patterns of the language.

FLJ 205 Intensive Intermediate Japanese. *Preq: FLJ 105 or FLJ 102. 6(6-0) S.* An intensive study of standard, formal Japanese on the intermediate level with increased emphasis on reading and writing.

FLJ 301 Intermediate Japanese III. *Preq: FLJ 202 or FLJ 205. 3(3-0) F.* Last of the foundation courses in Japanese. Continued use of spoken Japanese but greater emphasis on reading and writing, including further exposure to cultural traditions.

FLJ 302 Intermediate Japanese IV. *Preq: FLJ 301. 3(3-0) S.* Review of basic grammar and preparation for advanced reading and composition. Some advanced conversation, with attention to cultural values.

FLJ 401 Advanced Japanese I. *Preq: FLJ 302. 3(3-0) F.* A thorough review of the more advanced aspects of the grammar of the Japanese language, with extensive practice in reading and writing and further sensitization to Japanese cultural values.

FLJ 402 Advanced Japanese II. *Preq: FLJ 401. 3(3-0) S.* Elaboration of grammatical forms learned in the previous courses with applications in reading and writing, combined with more sophisticated vocabulary and idioms and attention to cultural background and tradition.

FLJ 411 Readings in Modern Japanese I. *Preq: FLJ 402. 3(3-0) F.* Reading of selected articles in modern Japanese chosen from a list by the students to reflect their individual interests. Readings encompassing a broad range of issues in Japanese culture and society. Emphasis on both accurate comprehension of content and retention of the most frequently encountered Chinese characters (*kanji*).

FLJ 412 Readings in Modern Japanese II. *Preq: FLJ 411. 3(3-0) S.* Readings of selected articles in modern Japanese which reflect current issues in Japanese society and culture. Includes newspapers and both popular and specialized magazines. Emphasis on literary and journalistic idioms as well as characters.

SWAHILI (KISWAHILI) LANGUAGE AND LITERATURE

FLK 101 Elementary Swahili I. *3(3-0) F.* First in a four-course sequence to develop language skills in Swahili (Kiswahili). Oral and written practice. Readings in African cultures and civilization.

FLK 102 Elementary Swahili II. *Preq: FLK 101. 3(3-0) S.* Second in a four-course sequence to develop language skills in Swahili (Kiswahili). Oral and written practice. Readings in African culture and civilization.

FLK 201 Intermediate Swahili I. *Preq: FLK 102. 3(3-0) F.* Third in a four-course sequence to develop language skills in Swahili (Kiswahili). Oral and written practice. Readings in African culture and civilizations.

FLK 202 Intermediate Swahili II. *Preq: FLK 202. 3(3-0) S.* Fourth in a four-course sequence to develop language skills in Swahili (Kiswahili). Oral and written practice. Readings in African culture and civilizations.

PORTUGUESE LANGUAGE AND LITERATURE

FLP 101 Elementary Portuguese I. *3(3-0) F.* Introduction to the fundamentals of Brazilian Portuguese: pronunciation, comprehension, and spoken syntax and grammar.

FLP 102 Elementary Portuguese II. *Preq: FLP 101. 3(3-0) S.* Continuation of the essentials of Brazilian Portuguese. Further stress on pronunciation and comprehension and introduction of reading and writing skills.

RUSSIAN LANGUAGE AND LITERATURE

FLR 101 Elementary Russian I. *3(3-0) F.* First in a four-course sequence to develop language skills in Russian. Oral and written practice in the classroom and language laboratory and attention to Russian cultural heritage.

FLR 102 Elementary Russian II. *Preq: FLR 101. 3(3-0) S.* Emphasis on acquisition of basic oral skills, with complementary reading and writing exercises and attention to Russian cultural heritage.

FLR 201 Intermediate Russian I. *Preq: FLR 102. 3(3-0) F.* Learning of basic Russian language skills is continued. More emphasis given to writing and essential conversational practice. Intermediate level readings in Russian literature and culture. Class and laboratory practice; written assignments.

FLR 202 Intermediate Russian II. *Preq: FLR 201. 3(3-0) S.* Study of more advanced aspects of Russian syntax through reading of prose of Russian writers. Continued attention to conversational practice and vocabulary building.

FLR 303 Russian Literature in Translation: The Nineteenth Century. *3(3-0) S, Alt. yrs.* A study of selected plays, short stories and novels of the great Russian writers of the nineteenth century: Pushkin, Lermontov, Gogol, Goncharov, Turgenev, Dostoevsky, Saltykov-Shchedrin, Leskov, Tolstoy and Chekhov. Examines the peculiarly Russian as well as the universal aspects of this literature. All readings, lectures and discussions in English.

FLR 304 Russian Literature in Translation: The Twentieth Century. *3(3-0) S, Alt. yrs.* A study of selected poems, plays, short stories and novels by major Russian writers of the twentieth century, such as Chekhov, Gorky, Blok, Mayakovsky, Esenin, Zamyatin, Olesha, Bulgakov, Babel, Pilnyak, Pasternak, Solzhenitsyn, Evtushenko, and Voznesensky. All readings, lectures and discussions in English.

SPANISH LANGUAGE AND LITERATURE

FLS 101 Elementary Spanish I. *3(3-0) F,S,Sum.* Concentrates on listening and speaking, and begins the development of a balanced foundation in all Spanish language skills. Idiomatic, everyday Spanish and cultural awareness are emphasized. Class practice, laboratory and written homework.

FLS 102 Elementary Spanish II. *Preq: FLS 101. 3(3-0) F,S,Sum.* Expands use of Spanish through past tenses, regular and irregular, and various morphological and syntactical aspects. Emphasis on oral skills and increased cultural awareness. Written work and laboratory practice assigned daily.

FLS 105 Intensive Elementary Spanish. *6(6-0) F,S.* An intensive course aimed at developing a balanced foundation in listening, speaking, reading, and writing Spanish. Equivalent to FLS 101 plus FLS 102.

FLS 201 Intermediate Spanish I. *Preq: FLS 102 or 105. 3(3-0) F,S,Sum.* The third of four consecutive Spanish courses. As with 101 and 102, its aim is mainly to teach idiomatic, spoken Spanish. Reading and writing skills receive greater attention than previously, as does the cultural heritage of the Spanish-speaking peoples. Class practice, laboratory and written assignments.

FLS 202 Intermediate Spanish II. *Preq: FLS 201. 3(3-0) F,S,Sum.* Last of four sequential courses, completing the learning of the foundations of the Spanish language. Writing receives greater attention, as well as the cultural heritage of Spanish-speaking peoples.

FLS 208 Intermediate Spanish Conversation. *Coreq: FLS 201. 3(3-0) F,S.* Intensive practice in speaking and understanding Spanish through role playing, discussion, interviews and use of audio-visual materials.

FLS 300 Introduction to Hispanic Literatures. *Preq: FLS 202. 3(3-0) F,S,Sum.* An introduction to the major literary genres and movements in Spanish and Latin American literatures. Lectures, discussions, films and written assignments.

FLS 301 Survey of Spanish Literature Through Golden Age. *Preq: FLS 202. 3(3-0) F.* Literature of Spain and Spanish America from the Middle Ages to the beginning of the eighteenth century.

FLS 302 Survey of Spanish Literature: 1700 to Present. *Preq: FLS 202. 3(3-0) S.* Introduction to Spanish Neoclassicism, Romanticism, Realism, and subsequent literary production. Special attention to the quest for new values in contemporary literature.

FLS 304 Modern Latin American Literature. *Preq: FLS 202. 3(3-0) S, Alt. yrs.* A survey of modern Latin American Literature from *Modernismo* to the present.

FLS 307 Business Spanish. *Preq: FLS 202. 3(3-0) F.* Business Spanish vocabulary and terminology. Emphasis on everyday spoken and written Spanish. Readings and discussions of topics. Cross-cultural considerations relative to international business operations.

FLS 308 Spanish Conversation and Reading. *Preq: FLS 202. 3(3-0) S.* Intensive practice in speaking and reading Spanish. Drills and conversation emphasizing practical language and idiomatic expressions.

FLS 309 Spanish Phonetics and Advanced Conversation. *Preq: FLS 202. 3(3-0) F.* The production of the sounds of Standard Spanish with the aim of improving pronunciation, fluency, and skill in communication. Extensive oral practice in phonetics and conversation.

FLS 310 Advanced Spanish Grammar. *Preq: FLS 202. 3(3-0) S.* Advanced aspects of Spanish grammar, with extensive practice in writing. Lectures, discussions and compositions incorporate topics relevant to Hispanic culture and civilization.

FLS 311 Advanced Spanish Composition. *Preq: FLS 202. 3(3-0) F.* An intensive course in the theory and practice of Spanish composition. Lectures, discussions and weekly writing assignments are required.

FLS 315 Culture and Civilization of the Iberian Peninsula. *Preq: FLS 202. 3(3-0) F.* The Iberian Peninsula as a crossroads of civilizations from neolithic times to the present. The emergence of Spain and Portugal as nations, the rise and fall of their overseas empires, and their contemporary civilizations.

FLS 316 The Culture and Civilization of Latin America. *Preq: FLS 202. 3(3-0) S.* Survey of the cultural traditions of Latin America including Brazil. The major pre-Columbian civilizations, Spanish and Portuguese colonialism, the emergence of the modern nations. Films and recordings supplement readings and discussions.

FLS 323 Contemporary Spanish Literature. *Preq: FLS 202. 3(3-0) S. Alt. yrs.* Selected works of Spanish fiction, essays and poetry in the twentieth century. Special attention is given to the Generations of 1898 and 1927 and to post-Civil War writers.

FLS 400 Methods and Techniques in Spanish Translation and Interpretation. *Preq: FLS 202. 3(3-0) S. Alt. yrs.* Study and practical application of theory, methods and techniques of translation based on materials relevant to various fields and professions.

FLS 403 Spanish Prose Fiction to 1900. *Preq: Consent of department. 3(3-0) F. Alt. yrs.* Spanish novel and short story from *La celestina* through the novels of Galdós. Major emphasis is given to the picaresque novel, *Don Quixote*, eighteenth-century didactic prose, and nineteenth-century Realism.

FLS 404 Spanish Drama. *Preq: Junior standing. 3(3-0) F. Alt. yrs.* Spanish drama from its beginning to the present. Special emphasis on Golden Age (16th and 17th centuries) and contemporary theater.

FLS 492 Seminar in Hispanic Studies. *Preq: Junior standing and consent of department. 3(3-0) S.* Advanced seminar on a specific area of Hispanic studies (topics vary), leading to a major term paper and/or a series of essays by the student.

GRADUATE CERTIFICATION ONLY

FLS 401 Spanish for Graduate Students. *Preq: Graduate standing; not open to undergraduates. 3(3-0) F.* Basic Spanish grammar, with special attention to characteristics of formal expository style, and illustrative readings. Study of extracts from scholarly publications in the students' areas of research. Graduate language certification granted on satisfactory completion of the course.

FORESTRY

FOR 110 Introduction to Forestry. *2(1-3) F.* Overview of the history and policies of forestry, the basis of forest management, the impact of forestry on nature and society, and the opportunities of a career in forestry. COOPER

FOR 204 Silviculture. *Preqs: Junior standing in FOR; meet summer camp eligibility standards; Coreq: FOR 261. 2(0-6) Sum (Summer Camp).* Growth dynamics of forest trees and stands coupled with an overview of the practice of silviculture; emphasis on understanding and integrating previously-learned ecological principles. Observation and practice of cultural measures commonly employed in southern forest types. JERVIS

FOR 212 Dendrology. *4(2-4) F.* Identification and basic biology of Eastern woody plants with studies of their classification, characteristics, and habitats. Consideration of important Northern and Western trees. Field identification and trips to natural forest communities. Required Saturday field trips. BRAHAM

FOR 252 Introduction to Forest Science. *Not open to forestry majors. 3(2-3) S.* Integration of biological principles into studies of tree growth, reproduction, establishment, survival, and disturbance. Discussions of regional silviculture, and of effects of humans on forest ecosystems. Instruction in forest sampling and tree identification. Many laboratories meet outdoors. BRAHAM, JERVIS

FOR 261 Forest Communities. *Preqs: Junior standing in FOR; meet summer camp eligibility standards. 2(0-6) Sum (Summer Camp).* Studies of the occurrence, distribution, and species composition of forest communities. Emphasis on Southeastern North America, but consideration of and comparison to Northeastern and Northern North America. Field trips to representative types in the Coastal Plain, Piedmont, and Mountains. BRAHAM

FOR 264 Forest Pest Management. *Preqs: Junior standing in FOR; meet summer camp eligibility standards. 1(0-3) Sum (Summer Camp).* Basic concepts of pest injury to trees. Recognition of the important insects and diseases of forest trees in the Southeast and the damage caused by them. Principles of silvicultural control of pests and the proper selection and use of pesticides. FARRIER, GRAND

FOR 265 Fire Management. *Preqs: Junior standing in FOR; meet summer camp eligibility standards. 1(0-3) Sum (Summer Camp).* Effects of wildfire and prescribed fire on forest ecosystem components and processes; fire behavior and the ecosystem and meterologic factors that affect it; silvicultural uses of fire; organization, equipment, and tactics for wildlife suppression; fire suppression exercises on the North Carolina Division of Forest Resources' Forest Fire Simulator. GREGORY

FOR (WPS) 273 Quantitative Methods in Forest Resources. *Preq: Soph. standing. 3(2-2) S.* Problem solving techniques using computers in the areas of forestry, wood technology, pulp and paper technology and recreation resources. Historical development of past techniques and tools, assessment of present technology, and an evaluation of problem solving tools, including an introduction to computer programming. ROISE

FOR 274 Mapping and Mensuration. *Preqs: Junior standing in FOR; meet summer camp eligibility standards. 4(0-12) Sum (Summer Camp).* Procedures and instruments for measuring tree parameters, stand density and site index. Determination of log and tree volume and planning, conducting and summarizing a timber inventory. Basic land measurements and the mapping of boundary surveys; use of maps and deed. LUNK

FOR 303 Forest Tree Physiology. *Preqs: BS 100, CH 103, PY 211, Summer Camp; Coreq: SSC 200. 3(3-0) F.* Structure of forest trees and the patterns, processes, and regulation of growth. Processes of primary productivity and the relationship of productivity and growth to environmental factors that affect tree growth. Evolution, variation and adaptation in trees; genetic control of physiological processes. Flowering and reproduction in forest trees. HENRY

FOR 304 Theory of Silviculture. *Preq: FOR 303. 4(3-3) Summer camp.* Theory and practices involved in natural and artificial forest stand regeneration including: species growth and silvical characteristics; soil/site relationships; site evaluation; insect and disease considerations; methods insuring desired species composition, yields and economics; diagnosis and prescription of intermediate stand treatments and harvesting methods; seedling production systems and tree improvement. Integration of other objectives with timber production. FREDERICK

FOR (FW) 310 Fisheries and Wildlife Inventory and Management. *Preqs: FW (ZO) 353 or FW (ZO) 420; junior or senior standing. 6(0-18) Summer camp.* (See Fisheries and Wildlife Sciences.)

FOR (PP) 318 Forest Pathology. *Preq: BS 100 or equivalent. 4(3-2) S.* (See Plant Pathology.)

FOR 319 Forestry Economics. *Preq: EB 212, Summer camp. 3(3-0) F.* Analysis of forestry as an economic enterprise on private and public lands. Topics include: evaluation of growing timber as long-term capital investment; forest taxation; timber markets; and the role of multiple-use considerations in decision making. HOLLEY

FOR 352 Forest Measurements and Management. *Preq: Not open to Forestry Majors. 4(2-4) F.* Basic boundary surveying and mapping, forest inventory including tree and log measurement, plot sampling, and data analysis; timber valuation, appraisal, marketing, and taxation; forest management planning, decision-making and yield forecasting. GREGORY, SMITH

FOR 353 Air Photo Interpretation and Photogrammetry. *Preq: Jr. standing. 3(2-3) F.* Theory, principles, and techniques of utilizing air photos for: 1) inventory and management of renewable resources; 2) photogrammetric and engineering applications; 3) hydrologic/terrain analysis; and 4) land use/cover mapping. Introduction to remote sensing and use of U-2 color infrared, thermal, Skylab, and Landsat imagery in resource mapping. KHORRAM

FOR 374 Forest Inventory, Growth and Yield. *Preqs: MA 114 or 241 or 242; FOR 274; ST 311; Coreq: FOR (WPS) 273. 3(3-0) S.* Mathematical functions for determining tree and log volume and tree taper, and for describing height-age and stand density relationships. Sampling methods and planning and conducting forest inventories. Use of computer models to estimate growth and yield of forest trees and stands for management decisions. SMITH

FOR (MEA, PM) 386 Agricultural and Forest Meteorology. *Preq: PY 211. 3(3-0) F.* (See Marine, Earth and Atmospheric Sciences).

FOR 401 Forest Hydrology and Watershed Management. *Preq: SSC 200. Not recommended for students below senior classification, non-forestry majors should contact the instructor prior to start of class. 4(3-3) F.* The hydrologic and energy cycles and the effects of forest and associated wildland vegetation on elements of those cycles. Water movement through forest ecosystems. Effects of forestry practices on water yield, soil conservation, and water quality. Principles of watershed management for single or multiple use. GREGORY

FOR (FW) 404 Forest Wildlife Management. *Preqs: BS 100 or equiv. plus 8 hours of biological sciences; advanced undergraduate or graduate student. 3(3-0) S.* (See Fisheries and Wildlife Sciences.)

FOR 405 Forest Management. *Preqs: FOR 374, 319, 434. 4(2-4) F.* Fundamental principles and analytical techniques necessary in the planning, management and optimization of forest operations, formulation of objectives and constraints, yield forecasting, forest regulation, procurement, and marketing, inventory methods, and management plant preparation. Written and oral reporting are integral components of this course. SMITH

FOR 406 Forest Inventory, Analysis and Planning. *Preqs: FOR 405, FOR 353, FOR 273, Summer camp; ST 311. 4(0-16) S.* Independent field work in forest inventory, analysis, and planning. Students design and implement a timber and nontimber inventory, analyze stand conditions and growth, and prepare a long term management plan considering management objectives subject to economic, social, and ecological constraints. Includes several field trips to public and private forestry operations which may include overnight travel. BLANK, SMITH

FOR 411 Forest Tree Improvement. *Preq: Junior or senior standing in forestry. 3(3-0) S.* Tree improvement as it is applied in production forestry for both conifers and hardwoods. The variation, evolution, and genetics of forest trees. Methods for selection, breeding, seed production, and vegetative propagation. Studies of exotics, wood properties, and tree improvement as a forest management tool. ZOBEL

FOR 422 Consulting Forestry. *Preq: Senior standing in forestry. 3(2-2) F.* Forest land acquisition and ownership: ownership, appraisal, legal considerations, financial management and planning. Producing forest resources: timber, wildlife, recreation, farm products, water, minerals, specialty products, and development. Marketing forest resources: timber, recreation, farm leases, minerals, specialty products, and developed property. Forest resources consulting: forms of organization, pricing and of services, consultant-client relationships (Law of Agency), professional ethics and continuing education.

FOR (WPS) 423 Forest Machinery and Systems. *Preq: Junior standing in FOR, WST, or BAE. 3(2-3) F.* Applications of engineering principles to problems in the forest industry including harvesting, road layout, log transportation, woodyard and milling operations; power sources; testing, rating and capabilities of forest machinery; power requirements and utilization efficiencies, effects of vehicle design parameters on stability, safety, and operation under load; traction devices and vehicle mechanics; cost analysis and systems selection. HASSAN

FOR (WPS) 434 Management Decision Making in Forestry and Wood Products. *Preqs: FOR (WPS) 273 and MA 113 and 114. 3(3-0) S.* Management science techniques and applications in forest industry. Linear programming, simulation, decision theory and inventory theory. Techniques to solve decision making problems typically encountered. ROISE

FOR 472 Renewable Resource Policy and Management. *Preq: Junior standing. 4(3-2) S.* A legal-institutional approach to renewable resource management. Historic legal principles, constitutional provisions, location and organization of concerned agencies. Illustration of policy and principles through analysis of current issues and case studies. Examples from water resource development, coastal zone management, national forest and park policy, and implementation of the National Environmental Policy Act. ADAMS

FOR 491 Special Topics in Forestry and Related Natural Resources. *Preq: Consent of Instructor. 1-4 F,S,Sum.* Independent (or group) study or research of a forestry or related natural resources topic with a faculty supervisor of the student's choice. Also courses offered on a trial basis.

Selected 500-Level Courses Open To Advanced Undergraduates

FOR 511 Tree Improvement Research Techniques. *Preq: FOR 411 or GN 411. 3(1-4) S, Alt. yrs.*

FOR 512 Forest Economics. *Preq: Basic course in economics. 3(3-0) S.*

FOR (PP) 518 Advanced Forest Pathology. *Preq: PP 318 or equivalent. 3(3-0) F, Alt. yrs.*

FOR 534 Advanced Forest Management Planning. *Preq: FOR 405 or 434 or OR 501; Coreq: FOR 572A. 3(3-0) S, Alt. yrs.*

FOR 540 Advanced Dendrology. *Preq: FOR 212 or BO 403. 3(2-3) S.*

FOR (ENT) 565 Advanced Forest Entomology. *Preq: ENT 301 or ENT 502 or CI. 3(2-2) S, Alt. yrs.*

FOR 571 Advanced Topics in Growth and Yield. *Preqs: FOR 374, ST 311. 3(3-0) S.*

FOR 572A, B Forest Management Policies on the Public Lands. *2(2-0) S, Alt. yrs.*

FOR 580 Soil-Machine Interactions in Forest Operations. *Preq: FOR 423. 3(3-0) F, Alt. yrs.*

FOR 583 Tropical Forestry. *3(3-0) S.*

FOR (MDS, UNI) 584 The Practice of Environmental Impact Assessment. *4(0-8) F, Alt. yrs.*

FOR 593 Colloquium on Tropical Forestry. *1(1-0) S.*

FOR (FW) 594 Seminar in Wildlife Management. *1(1-0) Alt. S.*

FOOD SCIENCE

FS 201 Food Science and the Consumer. *3(3-0) F,S.* An introduction to the science and practice of providing a wholesome, nutritious, economical and readily available supply of basic and processed foodstuffs. Chemical nature, microorganisms, safety, preservation and processing; organic and health foods; nutrition and the consumer; world food problem.
CARROLL

FS (ANS, NTR) 301 Modern Nutrition. *Preq: Sophomore standing. Food science majors may use as a free elective only. 3(3-0) F,S.* (See Nutrition.)

FS (ANS, PO) 322 Muscle Foods and Eggs. *Preq: BS 100. 3(2-3) F.* Processing and preserving fresh poultry, red meats, seafoods, and eggs. Ante and post-mortem events as they affect quality, yield and compositional characteristics of muscle tissues.
BALL, LARICK

FS (ANS) 324 Milk and Dairy Products. *Preq: BS 100. 2(2-0). S.* Composition of milk and dairy products, federal standards, raw milk procurement, cleaning and sanitizing and quality attributes. HANSEN

FS 331 Food Engineering. *Preq: PY 211 or 221. 3(2-3) S.* Engineering concepts and their applications to the food industry. Mass and energy balances and principles related to fluid flow, heat transfer, steam generation and use, psychrometry, and refrigeration.
JONES

FS 400 Principles of Human Nutrition. *Preq: CH 220 or 221. 3(3-0) F.* Sources and properties of nutrients; function of nutrients in the human body; effect of food industry practices on nutrients. ALLEN

FS 402 Food Chemistry. *Preq: CH 220 or 221. 3(2-3) F.* Introduction to the biochemistry of foods emphasizing basic composition, structure, properties and nutritive value. The chemistry of changes occurring during processing and utilization of foods.

FS 403 Food Analysis. *Preq: FS 402. 3(1-6) S.* Principles, methods and techniques for quantitative physical and chemical analyses of food and food products. Results of analyses evaluated in terms of quality standards and governing regulations. HANSEN

FS (MB) 405 Food Microbiology. *Preq: MB 401. 3(2-3) F.* The microorganisms of importance in foods, and their cultural and metabolic activities. The physical and chemical destruction of microorganisms in foods and kinetics involved. The conversion of raw foods by microorganisms into altered foods, and the nutrition, growth and preservation of the culture involved. Foods as vectors of human pathogens. The evolution of microbiological standards for foods. P. FOEGEDING

FS 416 Quality Control of Food Products. *Preqs: FS 402, MB 401. 3(2-3) S.* Organization and principles of quality control for the food industry. Food laws and regulations, standards and specifications, sampling, statistical quality control, tests, cleaning and sanitation, and process control. SHELDON

FS 421 Food Preservation. *Coreq: MB 401. 3(2-3) F.* An examination of and methods employed in the preservation of foods. Major emphasis on thermal, freezing, drying and fermentation processes and their relationship to physical, chemical and organoleptic changes in product. The relationship of these preservation techniques to the development of an overall processing operation. CARROLL

FS 423 Muscle Food Technology. *Preqs: FS 322. 3(2-3) S.* Chemistry, processing principles, quality, functional evaluation and storage stability of processed muscle food products. BALL, LARICK

FS 425 Processing Dairy Products. *Preqs: FS 324. 3(2-3) F.* Unit operations in dairy processing. Formulation, processing, packaging and evaluation of fluid milk and manufactured products. HANSEN

FS (HS) 462 Postharvest Physiology. *Preq: BO 421. 3(3-0) S.* Preharvest and postharvest factors that affect market quality of horticultural commodities with an emphasis on technologies to preserve postharvest quality and extend storage life of fruits, vegetables and ornamentals.

FS 490 Food Science Seminar. *Preq: Sr. standing in Food Science or related field. 1(1-0) F,S.* Students research, prepare, and orally present selected or assigned current topics in Food Science. Emphasizes the importance of keeping abreast of developments in Food Science. Informal discussion relating to presentation by student and faculty.

FS 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

FS 493 Special Problems in Food Science. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

FS 495 Special Topics in Food Science. *1-3 F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

Selected 500-Level Courses Open To Advanced Undergraduates

FS 504 Food Proteins and Enzymes. *Preq: FS 402 or BCH 451. 3(2-3) Alt. F.*

FS 509 Food Lipids. *Preq: FS 402. 1(1-0) Alt. S.*

FS 510 Food Carbohydrates. *Preq: FS 402. 1(1-0) Alt. S.*

FS 511 Food Research and Development. *Preqs: FS 331, FS 402, FS (MB) 405. 3(2-3) S.*

FS (NTR) 530 Human Nutrition. *Preqs: FS 400 or NTR 415 or 419; BCH 451. 3(3-0) S.*

FS 580 Food Kinetics. *Preqs: MA 212, FS 331, FS 402, FS 405 or CI. 3(3-0) Alt. F.*

FS (BAE) 585 Food Rheology. *Preqs: FS 331 or MAE 314. 3(2-3) Alt. F.*

FS 591 Special Problems in Food Science. *Preq: Grad. or sr. standing. Maximum 6. F,S,Sum.*

FISHERIES AND WILDLIFE SCIENCES

FW (ZO) 221 Conservation of Natural Resources. *3(3-0) F,S,Sum.* Importance of natural resources and their role in the human environment. The physical, biological and ecological principles underlying natural resource conservation with attention to the biological consequences of human impacts. BROMLEY, NOBLE

FW (FOR) 310 Fisheries and Wildlife Inventory and Management. *Preqs: FW (ZO) 353 or FW (ZO) 420; junior or senior standing. 6(0-18) Sum.* Exercises involving resource inventory, habitat analysis and evaluation, population estimation techniques, vegetation identification, forest mensuration and silviculture, and development of management plans are presented. Activities are predominately field oriented in an off-campus setting. Overnight field trips are also required. LANCIA

FW (ZO) 353 Wildlife Management. *Preqs: BS 100, ZO 201 or ZO 303. 3(3-0) F.* Describes historical development from empirical practices to the scientific American system. The principles of management, protection, and conservation of those warm-blooded vertebrates of aesthetic, sport or food values in urban, rural and wilderness areas. POWELL

FW (FOR) 404 Forest Wildlife Management. *Preqs: BS 100 or equiv. plus 8 hours of biological sciences; advanced undergraduate or graduate student. 3(3-0) S.* Relationships between forest management and wildlife populations and the effects of various silvicultural techniques on wildlife are discussed. Habitat requirements of individual species, habitat evaluation procedures and habitat manipulation techniques are emphasized. LANCIA

FW (ZO) 420 Fishery Science. *Preqs: ZO 201 or 303, ZO 360. 3(2-2) F.* Fishery biology and ecology. Emphasis on the life history and biology of important sport and commercial fishes, the role of fishes in aquatic ecosystems, fisheries population biology, and theory and practice of fisheries management. Examples from freshwater, estuarine and marine systems. Laboratory covers methodology, sampling, age and growth analyses, and population estimation. CROWDER

FW (ZO) 430 Fisheries and Wildlife Administration. *Preqs: Political science course and either FW (ZO) 420 or FW (ZO) 353; advanced undergraduate or graduate standing. 3(3-0) S.* Describes and compares the administrative structures and programs of federal and state fish and wildlife agencies and develops an understanding of the basis on which these agencies function. Evaluate the interrelationships that fisheries-wildlife professionals, special interest groups, public agencies and legislative bodies play in resource management programs. DOERR

FW (AC) 485 Natural Resources Advocacy. *Preq: ENG 333. Jr. or Sr. level with at least 10 hours of biology. 3(2-3) S.* Analysis of natural resources problems as they affect management agencies and user groups. Development of professional attitudes, policies, and skills needed for the management of sensitive natural resource issues through application of techniques in the field. Student presentations, demonstrations and development of natural resource planning models that integrate biological skills with management alternatives and are critiqued by resource field staff. BROMLEY

FW 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

FW 493 Special Problems in Fisheries and Wildlife Sciences. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

FW 495 Special Topics in Fisheries and Wildlife Science. *1-3 F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

Selected 500-level courses open to Advanced Undergraduates

FW (ZO) 515 Growth and Reproduction of Fishes. *Preq. or coreqs: GN 411, ZO 420, 421, 441. 3(2-3) S. Alt. yrs.*

FW (ZO) 553 Principles of Wildlife Science. *Preq: ZO (BO) 360. 3(2-3) F.*

FW (ZO) 554 Wildlife Field Studies. *Preq: Nine hrs. of FW or grad. standing. 3(2-3) S. Odd yrs.*

FW (ZO) 586 Aquaculture I. *Preqs: ZO (BO) 360, sr. or grad. standing. 3(3-0) F.*

FW (ZO) 587 Aquaculture I Lab. *Preqs: ZO (BO) 360, sr. or grad. standing; Coreq: FW 586. 1(0-3) F.*

FW (FOR) 594 Seminar in Wildlife Management. *1(1-0) S. Alt. yrs.*

GRAPHIC COMMUNICATIONS

GC 101 Engineering Graphics I. *2(1-2) F, Sum.* Graphical representation and solution of 2D and 3D spatial problems. Emphasis on development of logical and analytical approaches to problem solution. Conventional methods of graphically describing size and shape to represent basic mechanical elements. Includes practical engineering drawing applications.

GC 120 Foundation of Graphics. *3(2-2) F, S.* Introduction to technical orthographic, axonometric, oblique and perspective sketching and drawing for non-engineering students. Major emphasis is on describing shape and size of spatial problems by graphic methods. Application of graphical approaches to problem-solving. Opportunity to concentrate on problems relevant to each student's specific area of study.

GC 200 Applied Computer Aided Drawing. *Preqs: GC 101 or GC 120; and consent of the instructor. Restrictive enrollment. 3(2-2) F,S.* Uses and techniques of computer-aided drawing for industry, based on principles and standards of engineering graphics. Systematic methods of visualizing, constructing and graphically modeling two and three dimensional objects and materials for manufacturing and construction. Techniques for creating, storing, retrieving, scaling, editing, dimensioning and printing out drawing data base files.

GC 207 Engineering Graphics II. *Preq: GC 101 or GC 120. 3(2-2) F,S.* Advanced engineering graphics concepts and analytical skills relevant to the preparation of design, detail, and assembly production drawings for communicating technical data. General manufacturing materials and processes and the representation of common fasteners, basic machine elements, and structural components. Freehand sketching and instrument drawing emphasized.

GC 240 Furniture Graphics. *Preq: GC 101. 3(1-4).* Strengthen and adds knowledge of drawing concepts and skills with emphasis on sketching and special conventions that apply to furniture drawings; develops manufacturing and materials specification for furniture production.

GC 300 Advanced Graphics Development with CAD/D. *Preq: GC 200 and consent of instructor. 3(2-2) F,S,Sum.* Interaction with advanced integrated computer aided drafting/-design and modeling workstation. Develop and define accurate geometry of machine parts and analyze problems involving spatial relationships. Includes 2-dimensional drafting and design and 3-dimensional solid modeling CAD/D packages. Engineering drawing fundamentals and standards will be emphasized.

GC 320 3D Spatial Relations. *Preq: GC 101. 3(2-2).* Analysis and solution of three-dimensional space problems utilizing graphic principles of orthogonal projection techniques. Application of studies of lines, surfaces, solids, surface intersections, surface development, vectors, and civil, mechanical, and geographical structures.

GC 420 Visual Thinking. *Designed for Engineering and technical students. 3(2-2).* Develop visual thinking skills through a series of exercises using various visual media. Integrates and stresses drawing and construction activities essential to visual thinking. Emphasis on direct observation (seeing), mental imagery and sketching that is based upon three-dimensional space. Develops students' visual and drawing skills and provides for their application toward solving open-ended spatial problems. Intended for the scientific and technically oriented student.

GC 496 Special Topics in Graphic Communications. *Preq: Consent of instructor.* Topical study in areas of current interest and need to students and/or needs of curricula served by Graphic Communications.

GENETICS

GN 301 Genetics in Human Affairs. *3(3-0) F,S,Sum.* Appreciation and understanding of genetics in everyday life. Genetic perspective on normal human development, birth defects, birth control, cancer, organ transplants, intelligence, mental illness, and radiation and chemical exposure and issues raised by applications of recently developed genetic techniques such as *in vitro* fertilization, genetic engineering and prenatal monitoring.
McKENZIE

GN 411 Principles of Genetics. *Preqs: BS 100, Junior standing. 4(4-0) F,S,Sum.* Basic concepts and principles of prokaryotic and eukaryotic genetics. Mendelian inheritance, polygenic inheritance, linkage and mapping, chromosome aberrations, population genetics, evolution, DNA structure and replication, gene expression, mutation, gene regulation, extranuclear inheritance, bacterial and viral genetics, and recombinant DNA technology.
ANDREWS, EMIGH,

GN 412 Elementary Genetics Laboratory. *Coreq: GN 411. 1(0-3) F,S.* Genetic experiments and demonstrations using a variety of bacterial, plant and animal organisms. Mendelian inheritance, linkage analysis, population genetics, cytogenetics, mutation, molecular genetics and biochemical genetics. KLOOS

GN 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

GN 493 Special Problems in Genetics. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

GN 495 Special Topics in Genetics. *1-3 F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

Selected 500-Level Courses Open To Advanced Undergraduates

GN 504 Human Genetics. *Preq: GN 301 or 411 or equivalent. 3(3-0) F.*

GN 505A,B,C Genetics I. *Preq: GN 411. 1-4 F.*

GN 506A,B,C Genetics II. *Preq: GN 411; Coreq; ST 511. 1-3 S.*

GN (PO) 520 Poultry Breeding. *Preq: GN 411. 3(2-2) S.*

GN (ZO) 540 Evolution. *Preq: Nine credits in biological sciences. 3(3-0) S.*

GN 560 Molecular Genetics. *Preqs: GN 411; BCH 451. 3(3-0) F, Alt. yrs.*

GN (BCH) 561 Biochemical and Microbial Genetics. *Preqs: BCH 451 or 551, GN 411 or 505, MB 401 or equivalent. 3(3-0) F, Alt. yrs.*

GREEK LANGUAGE AND LITERATURE

GRK 101 Elementary Greek I. *3(3-0) F.* Introduction to Classical Greek. Greek alphabet, basic grammar and syntax. Readings include Plato, Lysias and the New Testament.

GRK 102 Elementary Greek II. *Preq: GRK 101. 3(3-0) S.* A second course in Classical Greek, continuing and expanding the work of GRK 101. Completes study of grammar. Readings from major authors including Herodotus, Thucydides, and Xenophon.

GRK 201 Intermediate Greek I. *Preq: GRK 102. 3(3-0) F.* Introduction to Greek prose. Emphasis upon improvement of reading skill through vocabulary acquisition and study of complex grammar. Introduction to Attic dialect through reading Plato, and Koine Greek through reading the New Testament. Examination of the importance of these works to Western literature and culture.

GRK 202 Intermediate Greek II. *Preq: GRK 201. 3(3-0) S.* Reading in Homer's *Iliad* and the New Testament. Techniques of oral poetry. Study of the use of myth, and of the literary and historical significance of the *Iliad*. Analysis of differences between classical and Koinè Greek in the New Testament.

GRK (LAT) 310 Classical Mythology. *3(3-0) F.* Greek and Roman mythology through the writings and art of the Classical period. Discussion of creation stories, the major gods and heroes, the underworld and afterlife. Intellectual, religious and educational role of myth and of the most important theories of interpretation and classification. All readings and discussion in English.

GRK 320 Greek Tragedy in Translation. *3(3-0) F.* Tragedies of Aeschylus, Sophocles and Euripides in translation. Literary and social aspects of individual plays and tragic genre in fifth century. Selections from Aristophanes, Plato, Aristotle and Seneca on Greek tragedy.

GRK 333 Medical Terminology. *2(2-0) S.* Study of the formation of medical terms from their Greek and Latin roots designed both to build vocabulary and to teach the uses of a medical dictionary.

GRK 371 The Origins of American Mythology. *3(3-0) S.* Studies oral-traditional literature, formulaic myth composition and the Indo-European origins of the American folk hero. Readings include *Iliad, Gilgamesh,* Sanskrit *Puranas* and *Beowulf;* films such as *Stagecoach* and *Superman* are included.

HISTORY OF ART

HA 201 History of Art From Ancient Greece Through the Renaissance. *3(3-0) F,S.* Art from Ancient Greece and Rome through Italian Renaissance. Major art forms of painting, sculpture, and architecture.

HA 202 History of Art From the Renaissance Through the 20th Century. *3(3-0) F,S.* Art from the Northern Renaissance in Europe through the 20th century in Europe and America: painting, sculpture and architecture recent mixed media techniques such as collage, and trottage.

HA 203 History of American Art. *3(3-0).* A history of American Art (painting, sculpture and architecture) from the Colonial Period through the 20th century.

HA 298 Special Topics in Art History. *3(3-0).* Special topics in art history with emphasis on chronological periods such as 20th century art of the Italian Renaissance or on fields of art such as paintings, sculpture, photography, or architecture.

HA 310 History of Art and Photography. *3(3-0).* History of and the interaction between art and photography from the invention of photography to the present.

HA 401 19th Century European Art. *Preq: HA 201 or HA 202. 3(3-0).* Major stylistic movements of 19th century European art and the theoretical basis for their development. Covers Neo Classicism, Romanticism, Realism and Impressionism, and Post Impressionism.

HA 404 Italian Renaissance Masters. *Preq: 3 hrs. of HA. 3(3-0).* Development of Italian Renaissance art 1300-1550, including the pioneers of Giotto and Duccio; founders of the early Renaissance: Masaccio, Donatello, and Brunelleschi; great masters of the High Renaissance: Michelangelo, Raphael and Leonardo da Vinci. Works of art analyzed in terms of style, subject matter and historical context.

HA 498 Independent Study in History of Art. *Preq: 3 hrs. of HA and permission of instructor. 1-6.* Directed independent study of topics in the History of Art.

HISTORY

NOTE: 200-300 level courses open to all students without prerequisite. Previous course work in any particular field of history is not necessary in order to take any 200-300 level course.

HI 205 Western Civilization Since 1400. *3(3-0) F,S.* A survey of Western Civilization from the Renaissance to the present.

HI 207 Ancient World to 180 A.D. *3(3-0) F,S.* The ancient cultures of the Middle East, Greece and Rome, including Mesopotamian, Egyptian, Hebrew, Phoenician, Greek and Roman societies and cultures.

HI 208 The Middle Ages. *3(3-0) F,S.* Medieval civilization as it emerged from the declining Roman Empire through its apogee in the 13th century. The transition from the classical to the medieval world, the impact of the Germanic influx, the Islamic influence, the Crusades, and the political, economic, and social institutions of the High Middle Ages.

HI 209 Europe, Renaissance to Waterloo, 1300-1815. *3(3-0) F,S.* A survey of the period of transition from medieval to modern Europe. Includes the decline of medieval institutions, the Renaissance, the Reformation and Counter-Reformation, rise of Absolutism, the English 17th-century revolution, the French Revolution and Napoleonic era.

HI 210 Modern Europe 1815-Present. *3(3-0) F,S.* Survey of the history of European societies and political systems from 1815 to the present.

HI 215 Latin America to 1826. *3(3-0) F,S.* The origins and development of social, political, economic and religious institutions from pre-conquest times to the achievement of independence. The ancient American cultures; Spain and Portugal before 1492; conquest and settlement; Spanish rule in theory and practice; economic life; the Church; land and labor; the African contribution; the Portuguese in Brazil; the independence movements.

HI 216 Latin America Since 1826. *3(3-0) F,S.* Social, political, economic, and intellectual life in the 19th and 20th centuries, in Central and South America. The social structure of the new nations; 19th century liberalism; the force of tradition; relations with Europe and the United States; economic change; caudillo rule: 20th century upheavals; revolutions; political conflict.

HI 221 British History to 1688. *3(3-0) F,S.* History of the British peoples from earliest times to the Glorious Revolution. Social, political, constitutional developments; relationship between history and literature; synthesis of British cultures.

HI 222 History of British Cultures and Societies. *3(3-0) F,S.* British people from Glorious Revolution to the present. Social, political, constitutional development; history and literature; growth and decline of British empire; spread of British culture.

HI 233 The World in the 20th Century. *3(3-0) F,S.* National and international problems in the 20th Century Western and non-Western world; institutions and ideas at the turn of the century, origins and effects of the First World War, the post-war challenge to Western democratic supremacy, the Second World War, and problems of the post-war period.

HI 251 Early American History. *Credit will not be given both for HI 251 and HI 241 or HI 242. 3(3-0) F,S.* Themes in early American history; colonial clash and mix of culture; generation of an "American" consciousness; federalism and democracy in national politics; expansion and immigration; racial and sectional division.

HI 252 Modern American History. *Credit will not be given both for HI 252 and HI 243 or HI 244. 3(3-0) F,S.* Themes in modern American history; impact of war on American foreign and domestic policy; the repercussions of industrialization and economic modernization; continuity and change in American institutions and values; problem solving in pluralistic society.

HI 263 Asian Civilization to 1800. *3(3-0) F,S.* Introductory survey of the great civilizations of Asia; particular attention to India, China and Japan. Emphasis on comparative study of Asian religions, political systems, art, and literature.

HI 264 Modern Asia: 1800 to Present. *3(3-0) F,S.* Introductory survey of 19th and 20th century Asia, with attention to Japan, Southeast Asia, India and China. Emphasis on cultural and political crises of the 19th century and revolutionary transformations of the 20th century.

HI 275 Introduction to History of South and East Africa. *3(3-0) F,S.* The history of Southern and East Africa. The African kingdoms (Lunda, Buganda, and Zulu); the European encroachment; the origins of colonialism and the character of colonial societies and economies, South African apartheid; African protect, nationalism and independence.

HI 276 Introduction to History of West Africa. *3(3-0) F,S.* The history of Western Africa. Forest civilizations and the slave trade; trade and the expansion of Islam; colonialism in West Africa; African nationalism and the achievement of independence; and post-colonial West Africa.

HI 298 Special Topics in History. *3(3-0) F,S.* Used for new course development and for presentation of material or techniques not normally available in regular course offerings.

HI (REL) 320 Religion in American History. *3(3-0) F.* Representative people, movements, and thought in the major religions within the context of American society and culture.

HI 321 Ancient and Medieval Science. *3(3-0) F.* Selected topics in the history of pre-modern science are studied for both their intrinsic interest and to gain perspective on the nature of modern science. Examples are taken from pre-history, Mesopotamia, Egypt, Greece, Rome, Islam, and the medieval Christian West, with the possibility of comparisons to other cultures. SYLLA

HI 322 Rise of Modern Science. *3(3-0) F,S.* Science in the Renaissance and Scientific Revolution of the 16th and 17th centuries. Newtonian science. Mechanics and the chemical revolution in the 18th century. Scientific synthesis in the 19th century: physics, chemistry, geology, and biology. 20th century revolutions in physics. Attention is paid both to scientific ideas and to the cultural and institutional contexts of science.
MULHOLLAND, KIMLER, SYLLA

HI (REL) 324 American Religion After Darwin. *3(3-0).* (See Religion.)

HI 333 History of American Sport. *3(3-0) S.* A history of American Sports: a reflection of and a factor within the development of American history. BEEZLEY

HI 336 America in Movies. *3(2-3) S.* An introductory study of American popular culture through important motion pictures portraying major themes, events and lives in American history. The "film image" is compared with leading historians' accounts of the same episodes in order to introduce some problems of what is "true history." WISHY

HI 339 History of Russia and the USSR. *3(3-0).* Russian and Soviet history from earliest times to the present. Political, social and cultural traditions of the Great Russians; formation of a multi-national empire in 18th and 19th Centuries; causes and consequences of 1905 and 1917 Revolutions; Stalin's upheaval and tyranny; continuity and change since Stalin; origins and course of the Cold War. SURH

HI 341 Technology in History. *3(3-0) S.* The role of technology in society from earliest times to the present. Major achievements in technology and an examination of the nature of invention, innovation and adaptation of technologies and their impact on Western Civilization. MULHOLLAND

HI 346 The Vietnam War. *3(3-0).* The Vietnam War in historical context. Relations of Vietnam with neighbors, north-south division, colonial influences; the origins and progression of American involvement; the course of the war; the impact of the war in Asia and America. HOBBS, OCKO

HI 348 History of Women in the United States. *3(3-0) Alt. yrs.* Women's roles related to economic and social change in the United States. Women in pre-industrial and industrial America; politics and reform; domestics, reproductive, and family patterns.

HI 350 American Military History. *3(3-0) F,S.* This course examines the American military experience and its relationship to other historical developments. The use of military force is considered in terms of strategy and tactics and as an element in the nation's diplomatic political, social, economic and intellectual life. HOBBS, R. McMURRY

HI 351 U.S. Naval History. *3(3-0) S.* The role of the U.S. Navy in American history. Sea power, national defense and foreign policy. The impact of technology on naval warefare and the historical evolution of missions of the U.S. Navy. HOBBS

HI 364 History of North Carolina. *3(3-0) F.* Surveys the history of North Carolina from early European exploration to the present. This course focuses on the features of North Carolina society which made this state similar to and different from other southern states and the nation as a whole. Field trips are included as feasible. HARRIS, O'BRIEN

HI 365 The American West. *3(3-0).* A history of the American Frontier with emphasis on the trans-Mississippi West. Cycles of exploration, conquest, and exploitation of this region. Influence of the frontier in the development of the United States. CRISP

HI 372 African-American History Through the Civil War, 1619-1865. *3(3-0).* African background and continuity of the particular role, experience and influence of African-Americans in the United States through the Civil War. L. McMURRY

HI 373 African-American History Since 1865. *3(3-0).* The history of African-Americans from the Reconstruction era through the Civil Rights movement of the 1950s and 1960s to the present. L. McMURRY

NOTE: Prerequisite for 400 level courses: Three hours of history. Junior standing or permission of instructor is required for 400 level courses that meet jointly with 500 level courses.

HI 400 Civilization of the Ancient Near East. *3(3-0).* The civilization of Mesopotamia and Egypt from earliest times to the fall of Babylon in 539 B.C. SACK

HI 403 Ancient Greek Civilization. *3(3-0).* The history of the Hellenes from the Minoan civilization through Alexander's legacy, with readings in Herodotus and Thucydides. SACK

HI 404 Rome to 337 A.D. *Preq: 3 hrs. of history. Credit will not be given for both HI 404 and HI 504. 3(3-0) Alt. yrs.* The development of ancient Rome from its origins in Italy, through the rise as an Empire embracing the entire Mediterranean World and Western Europe, to Constantine, Christianity and the foundation of Constantinople. Examines critically the political achievement of a people who rose from an obscure Italian city to a world empire, with emphasis on the analysis of primary sources. PARKER

HI 405 History and Archaeology of the Roman Empire. *Preq: 3 hrs. of history. Credit will not be given for both HI 405 and HI 505. 3(3-0) Alt. yrs.* Analysis of Rome's rule over the Mediterranean World in the first four centuries A.D. through the use of literary and archaelologic sources. Special emphasis on imperial army and frontier security. PARKER

HI 406 From Roman Empire to Middle Ages. *Preq: 3 hrs. of history. Credit will not be given for both HI 406 and HI 506. 3(3-0) Alt. yrs.* Late Antiquity and the early Middle Ages. The transition from classical civilization to the basis of modern civilizations: the fall of Rome, the Germanic kingdoms, Byzantium, the establishment of Christianity, the birth and growth of Islam. PARKER, RIDDLE

HI (REL) 407 Islamic History to 1798. *3(3-0).* The history of the Islamic Near East to 1798. Topics include the East Mediterranean before Islam, Muhammad and the development of Islam, sources of Muslim civilization, Islamic law, science, philosophy, art, and architecture, Islam in Spain, India, Asia, and Africa, the Crusades, the Ottomans, Islam and Europe. NEWBY

HI (REL) 408 Islam in the Modern World. *3(3-0).* Evolution of modern Islam from 17th century to the present, North Africa, Middle East and India. Pre-modern Islamicate empires, European intervention, Islamic reaction and response. Historical origins of current issues in the Islamic world. NEWBY, GILMARTIN

HI 409 The High Middle Ages. *Preq: 3 hours of history. Credit will not be given for both HI 409 and HI 509. 3(3-0) Alt. yrs.* Medieval culture from 10th through 13th centuries: revival of the Roman Empire, monastic and papal reform, rise of universities, evolution of representative bodies, the Gothic style, troubadour and goliardic poetry, scholasticism, and revival of Roman law. RIDDLE

HI 410 Italian Renaissance. *3(3-0).* Renaissance humanism, an educational ideal and an awareness of man as the sole creator in the historical world, is examined in its relationship to the Italian republics and princedoms of the 14th through the 16th century. BANKER

HI 411 The Protestant and Catholic Reformation of the 16th Century. *3(3-0).* The conditions and criticisms which led to reform and the nature of the institutional and theological changes affected by the various churches and sects. Special attention to Luther and Calvin. BANKER

HI 414 France in the Old Regime. *Preq: 3 hours of History. 3(3-0) F,S.* France from the sixteenth century to the Revolution, development of renaissance and absolutist state, social and economic change, religious reform and Enlightenment, origins and beginnings of the revolution.

HI 415 Revolutionary Europe. *Credit will not be given for both HI 415 and HI 515. 3(3-0).* A broadly based analysis of Europe's first revolutionary era. Topics covered are the Enlightenment and its impact, the causes and character of the Revolution in France, and the impact of these events in France and Europe. LURIA

HI 416 European Society and Culture in the 18th Century. *Credit will not be given for both HI 416 and HI 516. 3(3-0).* Study of social traditions and change in Western Europe in the 18th century. Population growth and its effects, changes in lower and middle class family, evolution of labor, experience and perception of poverty, types of popular protest. LaVOPA

HI 417 Europe in Crisis: 1890-1917. *Preq: 3 hours of history. Credit will not be given both for HI 417 and HI 517. 3(3-0) Alt. yrs.* Survey of the social, economic, political, ideological changes in Europe on eve of World War I; prewar origins of fascism and communism; political polarization during World War I to the outbreak of the Bolshevik Revolution.

HI 418 Fascism — Revolution — Reaction: Europe 1918-1939. *Preq: 3 hours of history. Credit will not be given for both HI 418 and HI 518. 3(3-0) Alt. yrs.* Rise and defeat of revolutionary movements in Central Europe and Italy (1918-1939); emergence and development of communism, fascism and nazism; crisis of the European socialist movement during the 1930's; the Spanish Civil War.

HI 419 Modern European Imperialism. *Credit will not be given for both HI 419 and HI 519. 3(3-0).* Historical background of European Colonialism; its impact on shaping the modern world; influence on modern independence movements, major power foreign policy, Third World concepts in international relations. GILMARTIN

HI 420 European Diplomatic History. *Credit will not be given both for HI 420 and HI 520. 3(3-0).* Survey of major issues and events in European international relations from the Congress of Vienna, 1815, to the defeat of Axis Powers and the origins of the Cold War in 1945. DE GRAND

HI 421 European Intellectual History: The Eighteenth Century. *Preq: 3 hours of history. Credit will not be given for both HI 421 and HI 521. 3(3-0) Alt. yrs.* Historical examination of some of the major figures of the European Enlightenment, beginning with Locke and ending with Kant. LaVOPA, VINCENT

HI 422 European Intellectual History: The 19th Century. *Preq: 3 hours of history. Credit will not be given for both HI 422 and HI 522. 3(3-0) Alt. yrs.* Historical examination of some of the major figures of European thought during the 19th century, beginning with the enthusiasm of the period of the French Revolution and ending with the disillusionment of the fin de siecle. VINCENT

HI 425 Tudor and Stuart England. *Preq: 3 hours of history. Credit will not be given for both HI 425 and HI 525. 3(3-0).* British history from the Reformation through the Civil War. Emphasis on key developments in social, political and economic life: The development of a new concept of kingship, the growing independence of Parliament, the search for religious uniformity and the changing status of the aristocracy and gentry. CARLTON

HI 429 20th Century Britain. *3(3-0).* British political, social and economic history since 1914, with reference to the effects of two world wars, the growth of the Welfare State, Britain's decline as a power, and its search for a new role in the world. CARLTON

HI 430 Modern France. *Preq: 3 hrs. of history. Credit will not be given for both HI 430 and HI 530. 3(3-0) Alt. yrs.* French history from the downfall of Napoleon I to the present, with a short introductory survey of the Old Regime and the French Revolution. Cultural, social, and economic developments and political trends. VINCENT

HI 431 Germany: Luther to Bismarck 1500-1871. *Preq: 3 hours of history. 3(3-0).* Germany from the Reformation national unification. Emphasizes the impact of socio-economic changes on politics and culture. LaVOPA

HI 432 History of Germany Since 1871. *3(3-0).* German history from the unification of 1871 to the present, concentrating on problems of nationalism and political and social reform. LaVOPA

HI 438 Russian Social and Cultural History. *3(3-0).* The formation of Russian secular culture in the setting of social backwardness and political repression during the last century of Tsarist Russia. The lives and works of Russia's major writers, thinkers, and political activists considered from the standpoint of modernization, nationalism, and revolution. SURH

HI 439 The Russian Revolution. *Credit will not be given both for HI 439 and HI 539. 3(3-0).* The Russian Revolution as a connected episode, from the late Imperial period through the degeneration of Bolshevism under Stalin; the origins of revolutionary politics and the causes of the collapse of Tsarist autocracy; the dynamics of revolutionary events of 1917-1921; economic recovery and cultural pluralism of the 1920s; political repression and industrialization of the 1930s. SURH

HI 440 U.S. Colonial Foundations. *3(3-0).* Similarities and differences among the seven major regions of Colonial British North America from their settlement through 1750. Settlement patterns, methods of land use, socio-economic organization, cultural interaction, religion and society, and the recruitment and employment of labor.

HI 442 The United States: Revolution to Constitution. *Credit will not be given for both HI 442 and HI 542. 3(3-0).* The conflict with Great Britain after 1763 leading to the declaring of independence; the war for American independence; the political, social, and ideological problems in establishing the government of the new nation.

HI 446 Civil War and Reconstruction. *Preq: 3 hours of history. Credit will not be given for both HI 446 and HI 546. 3(3-0) Alt. yrs.* Examination of sectional polarization of the 1850's, impact of the war on both northern and southern societies, and trauma of reconstructing the Union. HARRIS

HI 452 Recent America. *3(3-0).* Examination of contemporary opinions and "historical" interpretations of major problems in American life since 1939 including World War II, its social and economic consequences; Korea and the Cold War; big business and labor; civil rights and feminist movements; countercultures, Vietnam and Watergate. HOBBS

HI 453 United States-Latin American Relations Since 1823. *Preq: 3 hours of history. Credit will not be given for both HI 453 and HI 553. 3(3-0) Alt. yrs.* Analysis of periods, issues, and events in U.S.-Latin American relations since 1823, Monroe Doctrine, Manifest Destiny, Mexican and Spanish-American Wars, Dollar Diplomacy, Good Neighbor Policy, anti-Communist crusade since 1945, Alliance of Progress, U.S. responses to revolution. Historical perspective on contemporary inter-American problems—drugs, environment, debt crisis, human rights abuses.

HI 454 History of U.S. Foreign Relations, 1900-Present. *Credit for both HI 454 and HI 554 will not be allowed. 3(3-0).* America's emergence as a world power; American diplomatic history since 1900; the expansion of American economic and cultural relations; the evolution of the American foreign policy bureaucracy; and the historical forces and personalities that have shaped American relations with other nations. BEERS

HI 455 History of the Civil Rights Movement. *Preq: 3 hours of history. Credit will not be given both for HI 455 and HI 555. Alt. yrs.* The "black revolution"; stages and leaders of the movement; successes and failures in the fight for desegregation, the vote, and economic opportunity; impact of Civil Rights movement on the United States.

HI 456 American Heritage. *Credit will not be given for both HI 456 and HI 556. 3(3-0).* Development of American ideals since colonial times studied through the words of famous Americans and in the context of events like the American Revolution and the Great Depression. Stress on the conflicts, during important crises, between freedom and order, liberty and equality, free enterprise and social justice, religious truth and workaday morality, the nation and the world. WISHY

HI 457 Twentieth-Century U.S. Intellectual History. *Preq: 3 hours of history. 3(3-0) Alt. yrs.* American intellectuals and their views on 20th Century topics such as politics, culture, race and gender in historical context.

HI 458 Modern American Historical Biography. *3(3-0).* The impact on American life in the 20th century of some important people in fields such as politics, war and peace, sports and various forms of communication is explored through the medium of historical biography. JACKSON

HI 461 Civilization of the Old South. *Credit will not be given for both HI 461 and HI 561. 3(3-0).* The distinctive features of the Old South as part of the regional development of United States history. Consideration of colonial factors in the making of the South, development of the plantation system and slavery, Southern social order, intellectual and cultural life, economic development, and rise of Southern nationalism. CRISP, SMITH

HI 462 Social History of the New South. *Credit will not be awarded both for HI 462 and HI 562. 3(3-0).* Analysis of southern society from the Civil War through the present with an emphasis on social history methods, approaches, and sources. O'BRIEN

HI 465 History of Urban Life in the U.S. *Credit for both HI 465 and HI 565 will not be allowed. 3(3-0).* The historical background of today's urban problems. KING

HI 466 The History of Urban Life in the United States, 1865-Present. *Credit for both HI 466 and HI 566 will not be allowed. 3(3-0).* Designed to give the student an understanding of the historical background of today's urban problems. KING

HI 467 Modern Mexico. *3(3-0).* Major developments in Mexican national life since 1821. The 19th century: the era of Santa Anna, the war with the United States, the Reform, the

French intervention, and the dictatorship of Profirio Diaz. The 1910 Revolution and the resulting transformation of Mexico's political, social and economic institutions. Reading knowledge of Spanish helpful but not required. BEEZLEY

HI 468 Guerrillas and Soldiers in Latin America. *Credit will not be given for both HI 468 and HI 568. 3(3-0) Alt. yrs.* Military governments and guerrilla movements in recent Latin American history. Rise of militarism, philosophies and tactics of rural and urban guerrilla movements, and resulting conflict between soldiers and guerrillas in Bolivia, Peru, Argentina, Brazil, Uruguay, and Nicaragua. SLATTA

HI 469 Latin American Revolutions in the Twentieth Century. *Credit for HI 469 and HI 569 will not be given. 3(3-0).* The varieties of revolutionary change in twentieth-century American revolutions: Argentina, Bolivia, Peru, Cuba, and Chile. BEEZLEY, SLATTA

HI 471 Revolutionary China. *3(3-0).* China 1900 to present. Examination of political, cultural, and socio-economic revolutionary phases of China's 20th Century transformation from traditional empire to communism. Particular attention to post-1949 problems of nation-building. OCKO

HI 472 Modern Japan, 1850 to Present. *3(3-0).* Japan's emergence as a nation and world power. BEERS, OCKO

HI 473 20th Century Asian Revolutionaries. *3(3-0).* Use of psycho-historical techniques for comparative study of the lives and works of great figures in 20th century Asia: Sukarno, Mao Tse-tung, Mohandas Gandhi and Ho Chi-Minh. OCKO

HI 474 Modern India. *3(3-0) F.* The history of the Indian sub-continent, from the 16th century to the present. Focus on political, economic and cultural change under the Mughal Empire and the British Raj; the problems of independent India, Pakistan and Bangladesh. GILMARTIN

HI 475 History of the Republic of South Africa. *Preq: 3 hours of history. 3(3-0).* Evolution of the Republic of South Africa's society, with emphasis on the interaction of diverse peoples and cultures. Particular attention is given to the period since 1870. VICKERY

HI 476 Leadership in Modern Africa. *Credit will not be given for both HI 476 and HI 576. 3(3-0).* An investigation of the conditions under which 20th century African leaders have obtained and exercised power, together with detailed looks at the careers of several prominent African leaders. The case studies range from radicals to reactionaries, democrats to tyrants, and include such figures as Nkrumah, Kenyatta, Nyerere, Amin, Cabral, Vorster, and Senghor. VICKERY

HI 480 Scientific Revolution: 1300-1700. *Credit will not be given for both HI 480 and HI 580. 3(3-0).* Factors behind dramatic scientific changes of the seventeenth century. Role of mathematics and experiment. Interaction of the new science with trends in philosophy, religion, alchemy, magic, medicine, and with institutional, educational, political, economic and technological factors. SYLLA

HI 481 History of the Life Sciences. *Credit will not be given for both HI 481 and HI 581. 3(3-0).* Surveys the major ideas, methods, institutions, and individuals that have contributed to the biological sciences from antiquity to modern times and examines the connections between the life sciences and other aspects of culture, including the physical sciences, religious belief, medical practice, and agriculture. KIMLER

HI 482 Darwinism in Science and Society. *Credit will not be given both for HI 482 and HI 582. 3(3-0) Alt. yrs.* Darwinism and its reception by the scientific community and the general public. Social impact of theories of evolution as reflected in Social Darwinism, eugenics, sociobiology, and the relationship of science to ethics and religion. KIMLER

HI 486 History and Principles of Administration of Archives and Manuscripts. *Credit will not be given for both HI 486 and HI 586. 3(3-0) F.* Nature, importance and use of original manuscripts; the history and evolution of written records and institutions administering them; the principles and practices of archives administration. OLSON

HI 487 Application of Principles of Administration of Archives and Manuscripts. *Preqs: 3 hours of history plus HI 486. Credit in both HI 487 and 587 is not allowed. 3(0-9) S.* Internship training in the application of the principles and practices of archival management as developed in History 486. OLSON

HI 491 Seminar in History. *Preqs: 3 hours of history; Junior standing. 3(3-0) F,S.* Detailed investigation of selected topics in history. Consult Department of History for specific topics.

HI 495 Honors Research in History I. *Open only to seniors in history honors program. 2(0-2) F.* Preparation of the honors thesis. Topics and procedures to be determined by the student and the supervising faculty member.

HI 496 Honors Research in History II. *Open only to seniors in history honors program. 4(0-4) S.* Preparation of the honors thesis. Topics and procedures to be determined by the student and the supervising faculty member.

HI 498 Independent Study in History. *Permission of Instructor and departmental approval required. 1-6. F,S.* Extensive readings on predetermined topics focused around a central theme.

HORTICULTURAL SCIENCE

HS 100 Home Horticulture. *Credit is not allowed for both HS 101 and HS 100. For non-majors only. 3(3-0) F,S.* Introduction and review of home horticulture as it relates to the horticultural enthusiast. A general understanding of plant structure and development; house plants, flower arranging, home greenhouses, growing trees, shrubs, and flowers in the home landscape; vegetable and fruit gardening; pesticides for the home gardner, and other related topics. LANE

HS 101 Plants for Home and Pleasure. *3(2-3) F,S.* Basic uses of plants and flowers in and around the home. Indoor plants, flower arranging, home landscaping, and flower, vegetable and fruit gardening. LANE

HS 201 Principles of Horticulture. *3(3-0) S.* Basic principles of production, processing and utilization of fruit, vegetable, flower, and ornamental crops. The economic importance and distribution of horticultural enterprises. The roles of horticulture in world nutrition and food supply, improvement of environmental quality in the landscape, aesthetic values, and medicinal uses. LANE

HS 211 Ornamental Plants I. *Preq: BS 100. 3(1-5) F.* Identification, distribution, growth, characteristics, adaptation, and usage of ornamental plants. Emphasizes bedding plants, trees, and gymnosperms. FANTZ

HS 212 Ornamental Plants II. *Preq: BS 100. 3(1-5) S.* Identification, distribution, growth, characteristics, adaptation, and usage of ornamental plants. Emphasizes shrubs, ground covers, vines, bulbs, and interior landscape plants. FANTZ

HS 301 Plant Propagation. *Preq: BS 100, or BO 200. 4(3-3) F.* Theories and techniques necessary to the successful clonal and seed reproduction of higher plants. The influence of hereditary, environmental and pathological variation on the plant products. Recent developments in propagation techniques. BALLINGTON

HS 342 Landscape Horticulture. *3(2-3) F,S.* Introduction to design principles for landscaping small properties. Includes history, design process, site planning and user considerations, and choosing appropriate plant materials. Students will complete a series of landscape plans. Field trips to homes and gardens. HOOKER, TRAER

HS 371 Interior Plantscapes. *Preqs: BS 100 or BO 200; second semester sophomore standing. 3(2-3) S.* Identification, selection, installation, utilization, and maintenance of plants commonly used in commercial interior settings. LANE

HS 400 Residential Landscaping. *Preqs: DF 234; HS 211, 212, 342; HS 416 or DN 433; SSC 200, DN 257, 430. Seniors in the Landscape Horticulture area of concentration given*

priority. 6(0-9) F,S. Equips students with the necessary skills to create functional, aesthetic, and humanistic designs for residential and other small scale projects. Aspects of problem identification, project organization, design, execution, and evaluation will be studied to this end. HOOKER

HS 411 Nursery Management. *Preqs: BS 100, SSC 200. 3(2-3) F.* Principles and practices of production, management, and marketing of field-grown and container-grown nursery plants. One of three scheduled weekend field trips required. RAULSTON

HS 416 Principles of Ornamental Planting Design. *Preqs: HS 211, HS 212, HS 342, SSC 200, DN 234. 3(2-4) S.* Design principles for arrangement of plant masses in the landscape to correctly relate plant shapes, volumes, ornamental characteristics, scale changes with time, and adaptation to site conditions in order to create a successfully planted landscape. A weekend field trip will be required. TRAER

HS 421 Tree Fruit Production. *Preqs: BS 100 or BO 200, SSC 200, HS 201. 3(2-3) F.* Identification, adaptation, production and marketing methods of the principal tree fruit and nut crops of the United States. Fundamental principles underlying perennial plant culture applied to the production of specific fruit crops with emphasis on the crops of commercial importance in North Carolina. A weekend field trip is required. WERNER

HS 422 Small Fruit Production. *Preqs: BS 100 or BO 200; SSC 200; HS 201. 3(2-3) S. Alt. yrs.* Place and value of U.S. small fruit in the agricultural economy and in market and home gardens. Various cultural requirements of these crops and manipulation of their known morphological and physiological traits for successful production. A group project required. STAFF

HS 431 Vegetable Production. *Preq: BS 100, SSC 200. 4(3-3) F.* The most important commercially grown vegetable crops in the U.S. are treated individually, considering origin, botany, importance, genetics, physiology, storage, and marketing of each, but emphasizing production practices. Applied aspects of commercial field production in North Carolina are treated as a separate unit at the end of the semester. PEET

HS 440 Greenhouse Management. *Preq: BS 100 or BO 200. 3(2-3) F.* Perspective of worldwide floricultural production. Selection of greenhouse site, construction, heating, and cooling. Emphasis on greenhouse cost accounting and analysis. Other topics; root media, sanitation, water, fertilization, chemical growth regulation, temperature, light and marketing. Hands-on experience in greenhouse operations plus trips to commercial greenhouses and markets. NELSON

HS 441 Floriculture I. *Preqs: BS 100, SSC 200. 3(2-3) F.* Production and marketing procedures for fall-flowering floricultural crops. LARSON

HS 442 Floriculture II. *Preqs: BS 100, SSC 200. 3(2-3) S.* Production and marketing procedures for spring-flowering floricultural crops. LARSON

HS (FS) 462 Postharvest Physiology. *Preq: BO 421. 3(3-0) S.* Preharvest and postharvest factors that affect market quality of horticultural commodities with an emphasis on technologies to preserve postharvest quality and extend storage life of fruits, vegetables and ornamentals. BLANKENSHIP

HS 471 Tree and Grounds Maintenance. *Preqs: BS 100 or BO 200; PP 315; SSC 200. 4(3-3) S.* Principles and practices of shade tree and grounds maintenance. Shade trees, small flowering trees, and shrubbery; installation, pruning, transplanting, fertilization, structural support, and diagnosis and management of parasitic and non-parasitic disorders. WARREN

HS 490 Horticultural Science Seminar. *Preq: Junior/senior standing in horticultural science. May be taken only once for credit. 1(1-0) F.* Presentation of scientific articles, progress reports in research, and special problems in horticultuture and related fields. Students are required to select a subject of their interest, with the approval of the instructor, and give one seminar during the semester. Each seminar is formally evaluated by all of the students. LANE, MONACO

HS 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

HS 493 Special Problems in Horticultural Science. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

HS 495 Special Topics in Horticultural Science. *1-6 F,S,Sum.* Selected topics using an intensive literature review, independent study with instructor guidance; or new course development on a trial basis.

Selected 500-Level Courses Open To Advanced Undergraduates

HS 531 Physiology of Landscape Plants. *Preq: BO 421 or CI. 3(2-3) S.*

HS 532 Vegetable Crop Physiology. *Preqs: BO 421, HS 431, SSC 341. 2(2-0) F. Alt. yrs.*

HS 534 Vegetable Crops Practicum. *Preq: HS 431. 3(1-6) S. Alt. yrs.*

HS 595 Special Topics in Horticultural Science. *Preq: CI. 1-6 F,S,Sum.*

HS 599 Research Principles. *Preq: CI. Credits arranged, maximum 6.*

HUMANITIES AND SOCIAL SCIENCES

HSS 110-111 Humanities and Social Sciences Scholars Forum. *Enrollment limited to participants in the Scholars of the College Program. 0(2-0) F,S.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

HSS 200 Introduction to Women's Studies. *3(3-0) F.* Multi-disciplinary approach to Women's Studies. Exploration of feminist scholarship and research about women and gender in contemporary American society.

HSS 210-211 Humanities and Social Sciences Scholars Forum. *Enrollment limited to participants in the Scholars of the College Program. 0(2-0) F,S.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

HSS 298 Special Topics in Humanities and Social Sciences. *1-6 F,S.* Interdisciplinary study of selected topics in the humanities and social sciences.

HSS 310-311 Humanities and Social Sciences Scholars Forum. *Enrollment limited to participants in the Scholars of the College Program. 0(2-0) F,S.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

HSS (ANT, COM, SP) 392 International and Crosscultural Communication. *Concentration in International Studies. 3(3-0) S.* Patterns and problems of verbal and non-verbal forms of crosscultural communication. Avoidance and management of cultural conflict arising from awareness of characteristics of crosscultural communication. Impact on communication of differing cultural perspectives.

HSS 393 International Affairs Seminar. *Preq: HSS 392. Concentration in International Studies. 3(3-0) F.* An intensive study of selected international issues, each of which will be studied in terms of its global dimensions and implications.

HSS 398 Scholars Seminar in Humanities and Social Sciences I. *Enrollment limited to participants in the Scholars of the College program. 3(3-0) F.* Interdisciplinary study of selected topics in the humanities and social sciences; required of Scholars of the College students in their junior year.

HSS 399 Scholars Seminar in Humanities and Social Sciences II. *Enrollment limited to participants in the Scholars of the College program. (3-0) S.* Interdisciplinary study of selected topics in the humanities and social sciences; required of Scholars of the College students in their junior year.

HSS 400 Research Seminar in International Affairs. *Preq: HSS 393. 1-3 S.* Research seminar on individual topics; reports presented to the seminar, and research paper presented to Committee on International Studies.

HSS 410-411 Humanities and Social Sciences Scholars Forum. *Enrollment limited to participants in the Scholars of the College Program. 0(2-0) F,S.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

HSS (ALS) 490 International Seminar. *Junior standing. 1(1-0) S.* (See Agriculture and Life Sciences.)

HSS 492 Seminar in Women's Studies. *Preq: HSS 200. 3(3-0) S.* Examination of a topic or core area in Women's Studies, such as: women in literature, psychology of sex roles, changing gender relations in families, women's labor force participation, and the history of the women's rights movement.

INDUSTRIAL ENGINEERING

IE 100 Introduction to Industrial Engineering. *1(0-2) F,S.* Introduction to industrial and management engineering practice and concepts, including activity planning and control, human performance, resource allocation, operations improvement, and management systems. Illustrations of such functions in manufacturing, commercial, government or service organizations. Discussions and problems which relate to the design and operation of integrated systems of humans, machines, information and materials. Problem analysis, logic and application of the computer. CULBRETH, C. SMITH

IE 241 Furniture Manufacturing Processes I. *Preq: E 240; Coreq: WPS 202. 3(3-0) S.* Survey of furniture manufacturing technology emphasizing mass production equipment and its relationship to furniture product engineering. CULBRETH

IE 307 Real-Time Control of Manufacturing Processes. *Preq: CSC 111; Coreq: IE 100 and ECE 331. For IE, FMM and CSC majors and IE minors only. 3(2-2) F,S.* Introduction to the concepts of real-time control of manufacturing processes. System architecture, interface techniques, sensors and controls. An introduction to C as a language for manufacturing control and experience in the use of distributed computing resources. KING

IE 308 Control of Production and Service Systems. *Preqs: IE 361, ST 371. 3(3-0) S.* Planning and control of production and service systems. Production organization, flow and inventory control methods. Systems approach. HODGSON, NUTTLE

IE 311 Engineering Economic Analysis. *Preq: MA 102, MA 112 or MA 113. 3(3-0) F,S,Sum.* Engineering and managerial decision making. The theory of interest and its uses. Equivalent annual costs, present worths, internal rates of return, and benefit/cost ratios. Accounting depreciation and its tax effects. Economic lot size and similar cost minimization models. Sensitivity analysis. Cost dichotomies: fixed vs. variable, and incremental vs. sunk; use of accounting data. Replacement theory and economic life. Engineering examples. BERNHARD, CANADA

IE 340 Furniture Manufacturing Processes II. *Preqs: IE 241, WPS 205; Coreq: ENG 321, IE 352. 4(2-6) F.* A survey of furniture manufacturing technology. Emphasis is on operations, production rates, and the integration of many types of equipment into a manufacturing system. MORRISSEY

IE 341 Furniture Plant Layout and Design. *Preq: IE 340. 3(1-6) S.* Engineering design of an integrated furniture manufacturing system. Students do a layout project including equipment selection and location, materials handling methods, space utilization, and layout for operation and control. Additional topics include dust collection and safety. MORRISSEY

IE 345 Principles of Upholstery. *Preq: IE 241. 2(2-0) F.* The upholstery industry through an examination of product function, frame design principles, upholstery constructions, material properties, and manufacturing processes. Special problems involved in upholstery merchandising, order processing, labor utilization, inventory control, and costing.

IE 346 Casegoods Manufacturing. *Preqs: IE 340, WPS 301. 2(2-0) S.* Selected topics in casegoods furniture design, construction, and manufacturing. Emphasizes panel construction, panel manufacturing, and finishing methods. Applications in knock-down furniture design.

IE 347 Furniture Manufacturing Facilities. *Preq: IE 241; Coreq: IE 340. 2)2-0) Alt.F.* Types and characteristics of furniture plant support systems: boiler operations, steam generation and distribuation, wood waste handling and storage, electric power and compressed air distribution. Plant safety issues.

IE 351 Manufacturing Engineering. *Preqs: MAT 201, GC 101, IE 307. 3(2-3) F,S.* Analytical study and design of manufacturing processes. Emphasis on the economics, capabilities, and productivity of various processes in manufacturing, on the interrelations of materials, processes, and design with various aspects of manufacturing, and on applications of new developments in manufacturing, such as numerical control, robotics, and flexible manufacturing systems. MITTAL, SANII

IE 352 Work Analysis and Design. *Preq: ST 361, ST 371. 3(2-2) F,S.* Work methods and production processes to improve operator effectiveness and reduce production costs. Techniques studied include operation analysis, motion study, value engineering, predetermined time systems, time study and line balancing. C. SMITH

IE 355 Introduction to Occupational Safety & Health. *Preq: Soph. standing. 3(3-0) F.* Provides a basic understanding of safety and health practices of contemporary concern to the plant manager, safety engineer, etc. Emphasizes the applications of human factors, biomechanics, work physiology, toxicology, statistics, and engineering in accident prevention and control. Specific instruments used in the measurements of safety and health problems. AYOUB

IE 361 Deterministic Models in Industrial Engineering. *Preq: MA 303 or MA 405. For IE, ECE, and CSC majors and IE minors only. 3(3-0) F,S.* Introduction to mathematical modeling, analysis techniques, and solution procedures applicable to decision making problems in a deterministic environment. Linear programming models and algorithms and associated computer codes are emphasized. FATHI, NUTTLE, BERNHARD

IE 371 Furniture Production and Inventory Systems. *Preqs: IE 307, ST 361; Coreq: IE 340. 3(2-3) F.* Forecasting, inventory control, production planning and scheduling, shop floor control. Organization of production control; use of computers. Examples from the furniture industry. CULBRETH

IE 401 Stochastic Models in Industrial Engineering. *Preqs: ST 371; MA 303 or MA 405. For IE, ECE, and CSC majors and IE minors only. 3(3-0) F,S.* Introduction to mathematical modeling, analysis, and solution procedures applicable to decision making problems in an uncertain (stochastic) environment. Methodologies covered include dynamic programming, simulation, Markov chains, and classical optimization. Applications relate to problems such as inventory control, waiting lines, and system reliability and maintainability. BERNHARD, HODGSON

IE 420 Manufacturing Controls. *Preq: IE 311. 3(3-0) F,S.* Theory and methodology for developing and maintaining profitable manufacturing operations. Development of principles and procedures for control of materials, manpower and costs. Special attention to production and inventory control, equipment utilization, wage classification and cost reduction programs.

IE 440 Furniture Management Analysis. *Preq: IE 311, IE 341, IE 371. 3(1-4) S.* Economic decision making applied to the furniture industry. Selection of equipment, materials, methods and strategy from several feasible alternatives studied with the aid of actual case histories. MORRISSEY

IE (CSC) 441 Introduction to Simulation. *Preqs: MA 202, ST 372, programming proficiency. 3(3-0) F.* Techniques and applications of simulation for problem solving, including random number generation, input data analysis, waiting lines, variance reduction techniques, model verification and validation, and output analysis. Use of a simulation language illustrates approaches for the study of systems. Problems of interest to scientists and engineers. Programming required.
BISCHAK, PERROS, KING, ROBERTS

IE 443 Quality Control. *Preq: ST 361. 3(2-2) F,S,Sum.* Statistical methods in quality control; control charts for variables and attributes; inspection sampling plans and procedures. Industrial applications. ALDRICH, W. SMITH

IE 452 Ergonomics. *Coreq: IE 352. For IE and FMM majors and IE minors only. 3(2-2) F,S.* Introduction to man-machine-environment systems design and evaluation; applications to consumer products, tools, equipment, and the workplace. Overview of ergonomic research methodologies. Consideration of man's anatomical, physiological, and psychological capabilities and limitations as related to systems design and human performance. Use of anthropometric data in design. Display and control systems design. Effects of environmental stress upon work performance, safety, and health. AYOUB, ANTIN

IE 453 Facilities Design. *Preqs: IE 351, IE 352. 3(2-2) F,S.* inciples and practice in layout and material handling planning for industrial/service facilities. Integration of product and process and functional design of facilities. Computer software to optimize economic objectives. Group projects. TREVINO, CANADA

IE 472 Quantitative Methods in Furniture Manufacturing. *Preqs: IE 311; IE 340; IE 371. 4(3-2) S.* Quantitative methodologies for problem solving in furniture manufacturing operations. Deterministic and stochastic models, linear programming, decision theory, waiting line models, and computer simulation. Applications in resource allocation, production planning and control, project scheduling, systems analysis, and facilities design. Emphasis on computer-based problem solving. ALDRICH

IE 481 Engineering Economics (Mini). *Preq: Senior standing and MA 201. Not for IE, CE, EO, and FMM undergraduates or anyone having received credit for IE 301, IE 311 or equivalent. 1(3-0) S.* Time value of money concepts applied to economic comparison of investment and operating alternatives by equivalent annual worth, present worth, and rate of return methods. This course is presented at a rapid-pace during one-third of a semester.
CANADA, BERNHARD

IE 482 Work Methods and Measurement (Mini). *Preq: Senior standing and CI. Not for EO, IE and FMM undergraduates or anyone having received credit for IE 332 or equivalent. 1(3-0) F.* Review of classical industrial engineering activities: Systematic approach to work design and work measurement including methods analysis, classical time study techniques, and work sampling. This course is presented at a rapid-pace during one-third of a semester. C. SMITH

IE 485 Manufacturing Engineering (Mini). *Preq: Senior standing and CI. Not for IE and EO undergraduates or students who have taken MAT 400 or MAT 423. 1(3-0) F,S.* Manufacturing concepts stressing the interrelationship of materials and the processes that are used to develop finished products, with emphasis on metals. This course is presented at a rapid-pace during one-third of a semester. SANII

IE 487 Information Systems (Mini). *Preq: Senior standing and computer programming course. Not for IE or FMM undergraduates or other students having received credit for IE 307 or equivalent. 1(3-0) F.* An introduction to the generation, flow, processing, reporting and use of business information. System design and development, procedure design and documentation, role of user in system design and use of information. This course is presented at a rapid-pace during one-third of a semester. JOOST

IE 488 Production and Inventory Control (Mini). *Preq: Senior standing and CI. Not for IE and FMM undergraduates. 1(3-0) F.* An overview of production and inventory control including brief coverage of forecasting, scheduling, expediting, materials requirement planning (MRP). This course is presented at a rapid-pace during one-third of a semester.

IE 495 Project Work in Industrial Engineering. *Preq: Jr. standing and consent of instructor. 1-6 F,S.* Special investigations, study or research related to the field of industrial engineering or furniture manufacturing and management. In a given semester several students and/or student groups may be working in widely divergent areas under the direction of several members of the faculty.

IE 498 Senior Design Project. *Preqs: IE 308, 311, 441, 443, 452, 453. For Industrial Engineering majors only. 3(3-0) F,S.* Individual or group design projects requiring problem definition and analysis, synthesis, specification and presentation of a designed solution. Students work under faculty supervision either on actual industrial engineering problems posed by local industrial, service and governmental organization or on emerging research issues.

Selected 500-Level Courses Open To Advanced Undergraduates

IE (MA, OR) 505 Linear Programming. *Preq: MA 405. 3(3-0) F,S.*

IE (OR) 509 Dynamic Programming. *Preqs: MA 405, ST 421. 3(3-0) S.*

IE 511 Capital Investment Economic Analysis. *Preqs: IE 311, ST 371. 3(3-0) F.*

IE 512 Bayesian Decision Analysis for Engineers and Managers. *Preq: ST 371 or ST 421. 3(3-0) F.*

IE 515 Advanced Manufacturing Processes. *Preqs: IE 351 and EE 331 or equivalent. 3(3-0) F.*

IE 516 CAM I: A Systemic Approach to Computer Aided Manufacturing. *Preq: IE 351 or 485. 3(3-0) F.*

IE 518 Manufacturing Operations Management. *Preqs: MA 202 or MA 212; ST (EB) 350 or ST 372. 3(3-0) F.*

IE (MAE) 520 Industrial Robotics. *Preqs: IE 351 or 485; MA 301 or 303, 3(3-0) F.*

IE 521 Management Decision and Control Systems. *Preqs: IE 421, CSC 421 or equivalent. 3(3-0) S.*

IE 525 Organizational Planning and Control. *Preqs: Three credit hours in operations management (such as EB 325, IE 308). 3(3-0) S.*

IE (PSY) 540 Human Factors in Systems Design. *Preq: IE 452; Coreq: ST 507 or 515. 3(3-0) F.*

IE 541 Systems Safety Engineering. *Preqs: IE 452, ST 371. 3(3-0) S.*

IE 547 Reliability and Quality Assurance. *Preq: One of the following: IE 308, IE 371, ST 421 or ST 515. 3(3-0) S.*

IE 553 Materials Handling Systems. *Preq: IE 453. 3(3-0) S.*

IE 556 Industrial Logistics. *Preq: IE 453. 3(3-0) F.*

IE (OR) 561 Queues and Stochastic Service Systems. *Preq: MA 421. 3(3-0) F.*

IE (CSC, ECE) 575 Voice Input/Output Communication Systems. *Preqs: MA 202 and IE 307 or CSC 312. 3(3-0) F.*

IE (MA, OR) 586 Network Flows. *Preq: IE (OR, MA) 505 or equivalent. 3(2-2) S.*

IE 589 Special Topics in Industrial Engineering. *Preq: Grad. or sr. standing and CI. 1-4.*

LANDSCAPE ARCHITECTURE

(Also see DN—Design.)

LAR 234 Introduction to Environmental Design. *Not available for credit to design students except as free elective. 3(2-4) S.* An introduction to small-scale environmental design. Emphasis on drawing and modeling as ways of seeing and thinking about the environment and its development. Special attention is paid to the role of environmental factors (sun, water, soils, vegetation) in problem identification and solution.

LAR 400 Landscape Architecture Studio. *Preq: DF 102 or written approval of department head and dean. 6(0-9) F,S.* Projects cover small scale design, urban landscapes, community design, and environmental management. Design process stressed, including attention to project organization, design synthesis and realization.

LAR 430 Site Planning. *Preqs: MEA 101/110 or MEA 120/110 or SSC 200. 3(2-3) F.* Technical operations and environmental landscape controls for site development. Site analysis, grading and drainage, earthwork, horizontal and vertical control for road alignment. Graphic exercises.

LAR 433 Native Plants in Environmental Design. *3(2-3) S.* Analysis of natural processes relating to plant materials native to this region. Planting design theory. Planting design methods. Applications in a laboratory setting.

LAR 443 Landscape History. *3(3-0) F.* Human impact on the land over the past 20,000 years: development of agriculture, commerce and industry and their role in changing the face of the earth.

LAR 444 History of Landscape Architecture. *3(3-0) F, Alt. yrs.* History of landscape architecture: precedent work of primitives, early Americans, oriental cultures, European Middle Ages and the Renaissance. Origins and development of the profession with emphasis on the work of Frederick Law Olmstead.

LAR 457 Landscape Construction Materials, Methods and Documentation. *Preq: LAR 430. 3(2-3) S.* Materials, standards, and construction methods used to implement landscape architectural designs. Development of construction documents.

LAR 494 Internship in Landscape Architecture. *Preqs: Jr. standing in Landscape Architecture; 3.0 GPA or better; and written approval of department head. Maximum of 6 credit hours. 3-6 F,S.* Supervised field experience in landscape architecture offices and organizations.

LAR 495 Independent Study in Landscape Architecture. *Preqs: 3.0 GPA and Jr. standing. Maximum of 6 credit hours and approval of department head. 1-3 F,S.* Special projects in landscape architecture developed under the direction of a faculty member on a tutorial basis.

Selected 500-Level Courses Open To Advanced Undergraduates

LAR 512 Landscape Resource Management. *Preq: DN 431 or CI. 3(1-4) S.*

LAR 530 Advanced Site Planning. *Preqs: DN 457, DN 430. 3(2-2) S.*

LAR 533 Plants and Design. *3(2-2) Every yr.*

LAR 564 Management and Marketing Techniques in Community Design. *3(3-0) S. Alt. yrs.*

LATIN LANGUAGE AND LITERATURE

Note: All students with previous knowledge of French, German, Latin, or Spanish must take the placement test upon entering the University. They will be given advanced standing and receive credit according to their score.

LAT 101 Elementary Latin I. *3(3-0) F.* Beginning course in Classical Latin, emphasizing elementary grammatical form and basic syntax. Readings based on brief selections from Roman authors, including Cicero and Catullus.

LAT 102 Elementary Latin II. *Preq: LAT 101. 3(3-0) S.* A second course in Classical Latin, continuing and expanding the work of Latin 101. Completes study of grammar. Readings from a variety of Latin texts, in particular Livy Book I.

LAT 201 Intermediate Latin I. *Preq: LAT 102. 3(3-0) F.* Introduction to Latin prose and poetry. Emphasis on increased reading skill. Review of grammar fundamentals and exposure to new and more complex syntax. Examination of cultural significance of readings.

LAT 202 Intermediate Latin II. *Preq: LAT 201. 3(3-0) S.* Lyric poetry of Catullus and Horace emphasizing vocabulary, syntax, and techniques of Latin verse. Traditions and the evolution of lyric poetry and the social role of the Roman poet.

LAT (GRK) 310 Classical Mythology. *3(3-0) F.* (See Greek Language and Literature.)

MATHEMATICS

MA 101 Basic Algebra. *Credit for MA 101 (115) is not allowed if student has prior credit in any other mathematical course. MA 101 (115) may not be counted as credit toward meeting requirements. 4(5-0) F,S,Sum.* Preparation for MA 111 and MA 103 (116). Basic concepts and skills of algebra including algebraic operations, factoring, linear equations, functions, graphs exponents and radicals, complex numbers, quadratic equations, radical equations, inequalities.

MA 103 Topics in Contemporary Mathematics. *Preqs: MA 101 (115) or equivalent completed in high school. Credit for MA 103 (116) is not allowed if student has prior credit in MA 141 (102), 131 (112), 121 (113) or 114. 3(3-0) F,S,Sum.* Primarily for students in Humanities and Social Sciences. Course presents a collection of topics illustrating contemporary uses of mathematics, which may vary from one semester to another. Common offerings include selections from logic, counting procedures, probability, modular arithmetic, matrices, cryptography, mathematics of finance and game theory.

MA 105 Mathematics of Finance. *Preq: MA 101 (115) or equivalent completed in high school. 3(3-0) F,S,Sum.* Simple and compound interest, annuities and their application to amortization and sinking fund problems, installment buying, calculation of premiums of life annuities and life insurance.

MA 109 Precalculus Trigonometry. *Credit is not allowed for both MA 109 (100) and MA 111. For students in Engineering, Physical and Mathematical Sciences, Design, Biological and Agricultural Engineering (Science Program), Biological Sciences (all Options), Mathematics Education, and Science Education, credit in MA 109 (100) does not count toward graduation requirements. 2(2-0) F,S.* Basic topics from plane trigonometry which are needed for the study of calculus: angles, right triangles, trigonometric functions, graphs, identities, inverse functions, trigonometric equations, laws of sines and cosines.

MA 111 Precalculus Algebra and Trigonometry. *Preq: Placement via mathematics placement exam or MA 101. Credit in MA 111 does not count toward graduation for students in Engineering, Physical and Mathematical Sciences, Design, Biological and Agricultural Engineering (Science Program), Biological Sciences (all options), Mathematics Education, Forestry, and Textiles. 3(3-1) F,S,Sum.* Real numbers, functions and their graphs (special attention to polynomial, rational, exponential, logarithmic, and trigonometric functions), analytic trigonometry.

MA 114 Introduction to Finite Mathematics with Applications. *Preq: MA 111 or equivalent completed in high school. 3(3-0) F,S,Sum.* Elementary matrix algebra—addition and multiplication, inverses, systems of linear equations; introduction to linear programming including simplex method; sets and counting techniques; elementary probability—probability measures, conditional probability; Markov chains; applications in the behavioral, managerial and biological sciences.

MA 121 Elements of Calculus. *Preq: MA 111 or placement via NCSU Math Placement Exam. Credit is not allowed in more than one of MA 141 (102), 131 (112), 121 (113). MA 121 (113) may not be substituted for MA 141 (102) as a curricular requirement. 4(4-1) F,S,Sum.* For students who require only a single semester of calculus. Emphasis on concepts and applications of calculus, along with basic skills. Algebra review, functions, graphs, limits, derivatives, integrals, logarithmic and exponential functions, functions of several variables, applications in biological and social sciences.

MA 131 Analytic Geometry and Calculus A. *Preq: MA 111 or placement via NCSU Mathematics Placement Exam. Credit not allowed for more than one of MA 121, 131, and 141. 4(4-1) F,S,Sum.* Limits and derivatives; techniques of differentiation; applications of derivatives; logarithms, exponential and trigonometric functions; higher derivatives; definite integral and applications; integration techniques; examples and applications in biological and behavioral sciences and economics.

MA 141 Analytic Geometry and Calculus I. *Preq: MA 111 with grade of C or better or placement via Level Two Achievement Test. Credit is not allowed for more than one of MA 141 (102), 131 (112), 121 (113), 4(4-1) F,S,Sum.* First of three semesters of unified analytic geometry and calculus sequence. Functions, graphs, limits, derivatives of algebraic and trigonometric functions, indefinite and definite integrals, fundamental plane analytic geometry.

MA 214 Elementary Probability. *Preq: MA 131 (112), 121 (113) or 141 (102). 3(3-0) S.* Sample spaces, events, and probabilities; elementary counting procedures; conditional probability; discrete random variables—probability functions and expected values; normal random variables and density functions; examples and applications in biological, management, and behavioral sciences.

MA (CSC) 222 Applied Discrete Mathematics. *Preqs: CSC 101, MA 141. 3(3-0) F,S.* Formal logic. Methods of proof including induction. Introduction to grammars and finite state machines. Recurrence relations and asymptotic behavior of functions. Sets and counting. Boolean expressions and logic networks. Graphs and relations.

MA 225 Structure of the Real Number System. *Preq: MA 241 (201). 3(3-0)F,S.* Introduction to mathematical proof with focus on properties of the real number system. Elementary symbolic logic, mathematical induction, algebra of sets, relations, functions, countability, algebraic and completeness properties of the reals with applications to elementary probability theory.

MA 231 Analytic Geometry and Calculus B. *Preq: MA 131 (112). 3(3-0) F,S,Sum.* Multivariate calculus-partial derivatives, multiple integrals, applications; sequences, series, and Taylor's Theorem; differential equations; difference equations; examples and applications in biological and behavioral sciences and economics.

MA 241 Analytic Geometry and Calculus II. *Preq: MA 141 (102) with grade of C or better. 4(4-1) F,S,Sum.* Second of three semesters of unified analytic geometry and calculus sequence. Differentiation and integration of exponential, logarithmic, and inverse trigonometric functions. Techniques of integration. Complex numbers. Elementary differential equations. Sequences, series, power series, and Taylor's Theorem.

MA 242 Analytic Geometry and Calculus III. *Preq: MA 241 (201) with grade of C or better. 4(4-1) F,S,Sum.* Third of three semesters of unified analytic geometry and calculus sequence. Vectors and vector functions. Analytic geometry of three dimensional space. Functions of several variables, partial derivatives, gradients, directional derivatives, maxima and minima. Multiple integration. Line and surface integrals, Green's Theorem, Divergence Theorem.

MA 293 Special Topics in Mathematics. *Preq: Consent of Department Head. 1-6 F,S,Sum.* Freshman-sophomore level experimental course offerings or directed individual study.

MA 301 Introduction to Differential Equations. *Preqs: Credit for 12 hours of calculus; primarily intended for transfer students whose calculus backgrounds do not include a study of first and second order linear differential equations. Credit not allowed if MA 241 (201) taken previously at NCSU. 3(3-0) F,S.* First order differential equations with applications; second order linear differential equations with applications in mechanics and other areas; elementary matrix algebra, systems of linear equations and applications; Laplace transforms; Fourier series.

MA 302 Numerical Applications to Differential Equations. *Preq: CSC 101 or CSC 111; Coreq: MA 241. 1(1-0) F,S.* Several numerical methods for obtaining approximate solutions for differential equations. Included are series and Runge-Kutta methods. Applications made to problems involving systems of non-linear differential equations.

MA 303 Linear Analysis. *Preq: MA 242 (202); Coreq: ST 361. Credit not allowed if credit has been obtained for MA 301 or MA 341 or MA 405. 3(3-0) S.* Linear equations of first and second order, compound interest and amortization; differential equations of first and second order, growth and decay problems, population growth; matrix and vector algebra, simultaneous equations, eigenvalues, diagonalization, systems of difference and differential equations, population problems and Markov chains.

MA 305 Elementary Linear Algebra. *Preqs: MA 242 (202) or MA 231 (212); CSC 101 or CSC 111. Credit is not allowed for both MA 305 and MA 405. 3(3-0) F,S.* An elementary introduction to the essentials of linear algebra. Matrices and systems of linear equations, determinants, euclidean spaces as vector spaces, linear transformations of euclidean spaces, elementary treatment of eigenvalues and eigenvectors, applications to numerical solutions of equations and computer graphics.

MA 314 Probability with Applications to Electrical and Computer Engineering. *Preq: MA 242. 3(3-0) F,S.* Fundamentals of discrete and continuous probability: conditional probability, independence, random variables, density and distribution functions, expected value and variance, common discrete and continuous distributions, joint distributions, and introduction to simple stochastic processes. Applications to electrical engineering; reliability of series and parallel circuits, models for waiting time phenomena.

MA 341 Applied Differential Equations I. *Preq: MA 242. Credit is not allowed for both MA 301 and MA 341. 3(3-0) F,S,Sum.* Differential equations and systems of differential equations. Methods for solving ordinary differential equations including Laplace transforms, power series, and numerical methods. Matrix techniques for systems of linear ordinary differential equations. Fourier series and introduction to the heat equation.

MA 401 Applied Differential Equations II. *Preq: MA 341 or 301. Credit for both MA 401 and MA 501 will not be given. 3(3-0) F,S,Sum.* Wave, heat and Laplace equations. Solutions by separation of variables and expansion in Fourier Series or other appropriate orthogonal sets. Sturm-Liouville problems. Introduction to methods for solving some classical partial differential equations. Use of power series as a tool in solving ordinary differential equations.

MA 403 Introduction to Modern Algebra. *Preq: MA 225. Credit is not allowed for both MA 403 and MA 407. 3(3-0) F,S,Sum.* Sets and mappings, equivalence relations, rings, integral domains, ordered integral domains, ring of integers. Other topics selected from fields, polynomial rings, real and complex numbers, groups, permutation groups, ideals, and quotient rings.

MA 405 Introduction to Linear Algebra and Matrices. *Preq: MA 341 or MA 301. Credit is not allowed for both MA 305 and MA 405. 3(3-0) F,S,Sum.* Linear equations, operations with matrices, row echelon form, determinants, vector spaces, linear independence, bases, dimension, orthogonality, eigenvalues, reduction of matrices to diagonal forms, applications to differential equations and quadratic forms.

MA 407 Introduction to Modern Algebra for Mathematics Majors. *Preq: MA 225. Credit is not allowed for both MA 403 and MA 407.* Elementary number theory, equivalence relations, groups, homomorphisms, cosets, Cayley's Theorem, symmetric groups, rings, polynomial rings, quotient fields, principal ideal domains, Euclidean domains.

MA 408 Foundations of Euclidean Geometry. *Preq: MA 225 or MA (CSC) 322. 3(3-0) S.* A critique of Euclid's Elements, incidence and order properties, congruence of triangles, absolute and non-Euclidean geometry, the parallel postulate, real numbers and geometry.

MA 410 Theory of Numbers. *Preq: One year of calculus. 3(3-0) S.* Arithmetic properties of integers. Congruences, arithmetic functions, diophantine equations. Other topics chosen from quadratic residues, the quadratic reciprocity Law of Gauss, primitive roots, and algebraic number fields.

MA 414 Introduction to Differential Geometry. *Preqs: MA 242 (202) and MA 405. 3(3-0) S.* Introduction to the geometry of curves and surfaces from a modern point of view; calculus in Euclidean spaces, differential forms, calculus on surfaces as manifolds, integration of forms, curvatures, isometries, orientations, geodesics.

MA (CSC) 416 Introduction to Combinatorics. *Preqs: MA 242 (202) and proficiency in a programming language. 3(3-0) S. Alt. yrs.* Problems of enumeration, distribution and arrangement, inclusion-exclusion principle, recurrence relations, generating functions, difference equations, combinatorial identities, graphs, trees, diagraphs, systems of distinct representatives, matching problems, and optimization. Applications from computer science, operations research, and natural sciences.

MA 421 Introduction to Probability. *Preq: MA 242 (202) or MA 231 (212). 3(3-0) F,S,Sum.* Axioms of probability, conditional probability, combinatorial analysis, random variables, expectation, simple stochastic processes.

MA 425 Mathematical Analysis I. *Preq: MA 242 (202) (403 desirable). 3(3-0) F,S.* Real number system, functions and limits, topology on the real line, continuity, differential and integral calculus for functions of one variable. Infinite series, uniform convergence.

MA 426 Mathematical Analysis II. *Preqs: MA 425 and 405. 3(3-0) S.* Calculus of several variables, topology in n-dimensions, limits, continuity, differentiability, implicit functions, multiple integrals, line and surface integrals.

MA (CSC) 427 Introduction to Numerical Analysis I. *Preqs: MA 341 or 301 and programming language efficiency. 3(3-0) F.* Theory and practice of computational procedures using a ditigal computer, including approximation of functions by interpolating polynomials, numerical differentiation and integration, and solution of ordinary differential equations including both initial value and boundary value problems. Computer applications and techniques.

MA (CSC) 428 Introduction to Numerical Analysis II. *Preqs: MA 405 and programming language proficiency. MA (CSC) 427 is not a prerequisite. 3(3-0) S.* Computational procedures using digital computers. Solution of linear and nonlinear equations, matrices and eigenvalue calculations, curve fitting and function approximation by least squares, smoothing functions, and minimax approximations.

MA 430 Mathematical Models in the Physical Sciences. *Preqs: MA 341 or 301; and MA 405. 3(3-0) F.* Application of mathematical techniques to topics in the physical sciences. Problems from such areas as conservative and dissipative dynamics, calculus of variations, control theory, and crystallography.

MA 432 Mathematical Models in Life and Social Sciences. *Preqs: MA 301 or 341, 305 or 405., programming language proficiency; Coreq: MA 421 or ST 371. 3(3-0) S.* Topics from differential and difference equations, probability, and matrix algebra applied to formulation and analysis of mathematical models in biological and social science (e.g., population growth).

MA 433 History of Mathematics. *Preq: One year of calculus. 3(3-0) F,S.* Development of mathematical thought and evolution of mathematical ideas examined in a historical setting. Biographical and historical content supplemented and reinforced by study of techniques and procedures used in earlier eras.

MA 491 Reading in Honors Mathematics. *Preq: Membership in honors program, consent of department. 2-6 F,S.* A reading (independent study) course available as an elective for students participating in the mathematics honors program.

MA 493 Special Topics in Mathematics. *Preq: Consent of department. 1-6.* Directed individual study or experimental course offerings.

Selected 500-Level Courses Open To Advanced Undergraduates.

MA 501 Advanced Mathematics for Engineers and Scientists I. *Preq: MA 341 or 301 or his course and MA 401 is not allowed. 3(3-0) F,S,Sum.*

MA 502 Advanced Mathematics for Engineers and Scientists II. *Preq: MA 341 or 301 or equivalent. Any student receiving credit for MA 502 may receive credit for, at most, one of the following: MA 405, MA 512, MA 513. 3(3-0) F,S,Sum.*

MA (IE, OR) 505 Linear Programming. *Preq: MA 405. 3(3-0) F,S.*

MA 511 Advanced Calculus I. *Preq: MA 341 or 301. May not be taken for credit by undergrad. mathematics majors. 3(3-0) F,S,Sum.*

MA 512 Advanced Calculus II. *Preq: MA 341 or 301. 3(3-0) F,S,Sum.*

MA 513 Introduction to Complex Variables. *Preq: MA 242 (202). 3(3-0) F,S,Sum.*

MA 514 Methods of Applied Mathematics. *Preq: MA 511 or 425. 3(3-0) S.*

MA 515 Linear Functional Analysis I. *Preq: MA 426. 3(3-0) F.*

MA 517 Introduction to Topology. *Preq: MA 426. 3(3-0) F.*

MA 518 Calculus on Manifolds. *Preq: MA 426. 3(3-0) S.*

MA 520 Linear Algebra. *Preq: MA 405. 3(3-0) F.*

MA (E, OR) 531 Dynamical Systems and Multivariable Control. *Preqs: MA 341 or 301, 405 or equivalent. 3(3-0) F.*

MA 532 Theory of Ordinary Differential Equations. *Preqs: MA 341 or 301, 405, advanced calculus. 3(3-0) S.*

MA 534 Introduction to Partial Differential Equations. *Preqs: MA 425 or MA 511, MA 341 or 301. 3(3-0) F.*

MA (ST) 541 Theory of Probability I. *Preq: MA 425 or 511. 3(3-0) F,Sum.*

MA 545 Set Theory and Foundations of Mathematics. *Preq: MA 403. 3(3-0) S.*

MA (PY) 555 Mathematical Introduction to Celestial Mechanics. *Preq: MA 341 or 301. 3(3-0) F.*

MA (PY) 556 Orbital Mechanics. *Preqs: MA 341 or 301, 405, knowledge of elementary mechanics and computer programming. 3(3-0) S.*

MA (BMA, ST) 571 Biomathematics I. *Preq: Advanced calculus, reasonable background in biology or CI. 3(3-0) F.*

MA 581 Special Topics. *Preq: Consent of department. 1-6 F,S.*

MA (CSC) 583 Numerical Solution of Ordinary Differential Equations. *Preq: Knowledge to the level of CSC 427. 3(3-0) S.*

MA (CSC, OR) 585 Graph Theory. *Preq: MA 405. 3(3-0) F.*

MECHANICAL AND AEROSPACE ENGINEERING

MAE 206 Engineering Statics. *Preq: PY 205; Coreq: MA 242. 3(3-0) F,S,Sum.* Basic concepts, forces and equilibrium, distributed forces, frictional forces, inertial properties, application to machines, structures, and systems.

MAE 208 Engineering Dynamics. *Preq: MAE 206 or CE 214, MA 242. 3(3-0) F,S,Sum.* Equations of motion; kinematics, kinetics of mass points and systems of mass points; kinetics and kinematics of rigid bodies.

MAE 261 Aerospace Vehicle Performance. *Preqs: MA 241, PY 205. 3(3-0) S,Sum.* Introduction to the problem of performance analysis in aerospace engineering. Aircraft performance in gliding, climbing, level and turning flight. Calculation of vehicle take-off and landing distance, range and endurance.

MAE 301 Engineering Thermodynamics I. *Preqs: MA 242, PY 208 or 202. 3(3-0) F,S,Sum.* Introduction to the concept of energy and the laws governing the transfers and transformations of energy. Emphasis on thermodynamic properties and the First and Second Law analysis of systems and control volumes. Integration of these concepts into the analysis of basic power cycles introduced.

MAE 302 Engineering Thermodynamics II. *Preq: C or better in MAE 301, CSC 111. 3(3-0) F,S,Sum.* Continuation of Engineering Thermodynamics I with emphasis on the analysis of power and refrigeration cycles and the application of basic principles to engineering problems with systems involving mixtures of ideal gases, psychrometrics, nonideal gases, chemical reactions, combustion, chemical equilibrium, cycle analysis and one-dimensional compressible flow.

MAE 305 Mechanical Engineering Laboratory I. *Preq: Junior standing in ME. 1(0-3) F,Sum.* Theory and practice of measurement and experimental data collection. Laboratory evaluation and demonstration of components of the generalized measurement system and their effects on the final result. Applications of basic methods of data analysis as well as basic instrumentation for sensing, conditioning and displaying experimental qualities.

MAE 306 Mechanical Engineering Laboratory II. *Preqs: MAE 305. 1(0-3) S,Sum.* Continuation of MAE 305 into specific types of measurements. Students evaluate and compare different types instrumentation for measuring the same physical quantity on the basis of cost, time required, accuracy, etc.

MAE 308 Fluid Mechanics. *Preqs: MA 242; MAE 208 or CE 215 or CE 213; CSC 111 or 101; Coreqs: MA 341, MAE 301. 3(3-0) F,S,Sum.* Development of the basic equations of fluid mechanics in general and specialized form. Application to a variety of topics including fluid statics, inviscid, incompressible fluid flow; and viscous, incompressible fluid flow.

MAE 310 Conduction and Radiation Heat Transfer. *Preqs: CSC 111, MA 341, C or better in MAE 301. 3(3-0) F,S,Sum.* Analysis of steady state and transient one and multi-dimensional heat transfer by conduction, employing both analytical methods and numerical techniques. Heat transfer by the mechanism of radiation.

MAE 314 Solid Mechanics. *Preqs: MAE 206, CE 213 or CE 214; Coreq: MAT 201. 3(3-0) F,S,Sum.* Stress, strain and constitutive laws; application to axial, torsional, and bending stress and deformation; analysis of mechanical components and their strength based on material behavior under static loading conditions.

MAE 315 Dynamics of Machines. *Preqs: MAE 208, CSC 111; Coreq: MA 341; and a ME, AE major. 3(3-0) F,S,Sum.* Application of dynamics to the analysis of machines and mechanical devices. Motions resulting from applied loads and the forces and inputs required to produce specified motions.

MAE 316 Strength of Mechanical Components. *Preq: MAE 314, CSC 111; Coreq: MA 341; and a ME, AE, NE major. 3(3-0) F,S,Sum.* Study and prediction of the strength of mechanical components based on material behavior under static and dynamic operations

conditions. Applications to typical machine components including fasteners, welded joints, springs, curved and composite beams, thick-walled cylinders, stepped shafts, etc. Statistical considerations in design are also included.

MAE 355 Aerodynamics I. *Preqs: MAE 261, MA 341. 3(3-0) F.* Fundamentals of perfect fluid theory with applications to incompressible flows over airfoils, wings, and flight vehicle configurations.

MAE 356 Aerodynamics II. *Preqs: MAE 355 and a grade of C or better in MAE 301. 3(3-0) S.* Concepts of thermodynamics, compressible fluid flow, and shock waves with application to computing the aerodynamic characteristics of airfoils, wings and flight configurations at high speed.

MAE 357 Aerodynamics I Laboratory. *Preqs: MAE 261, MA 341; Coreq: MAE 355. 1(0-3) F.* Introduction to the subsonic wind tunnel, instrumentation techniques for performing experiments, and reporting of information. Experiments involve pressure and force measurements on complete, and components of, aerospace vehicles.

MAE 358 Aerodynamics II Laboratory. *Preq: MAE 357; Coreq: MAE 356. 1(0-3) S.* Introduction to the supersonic wind tunnel, instrumentation techniques for performing experiments, and reporting of information. Experiments involve pressure and force measurements on supersonic configurations.

MAE 365 Propulsion I. *Preqs: MAE 355 and a grade of C of better in MAE 301. 3(3-0) S.* One dimensional internal flow of compressible fluids including: isentropic flow, normal shocks, flow with friction, simple heat addition. Applications to air-breathing aircraft propulsion systems and overall performance of air-breathing engines.

MAE 371 Aerospace Vehicle Structures I. *Preqs: MAE 261, MAE 314. 3(3-0) F.* Determination of typical flight and landing loads. Use of the determined loads for analysis of typical aircraft structure. Analysis concepts required for the analysis of aircraft structural members.

MAE 403 Air Conditioning. *Preq: MAE 302. 3(3-0) F.* Fundamentals involved in the design of summer and winter air conditioning systems. Psychrometrics; load calculations; piping arrangements and sizing; duct layout and sizing; energy sources and diseminators; performance and selection of pumps and fans.

MAE 404 Refrigeration. *Preq: MAE 302. 3(3-0) S.* Thermodynamic analysis of the vapor compression cycle; optimization of multiple evaporator and multiple compressor systems; commercial refrigeration load calculations; desirable properties of refrigerants and brines, piping arrangement and sizing.

MAE 405 Mechanical Engineering Laboratory III. *Preq: MAE 306. 1(0-3) F,S.* Final undergraduate course in mechanical engineering laboratory sequence. Experimental investigation of measurement problems involving typical mechanical engineering equipment systems. Design and application of a measurement system to a specific problem.

MAE 406 Energy Conservation in Industry. *Preq: MAE 302 and MAE 310. 3(3-0) F.* Application of energy conservation principles to broad range of industrial situations with emphasis on typical equipment encountered in plant engineering: boilers, insulation, cogeneration, industrial exhaust systems, heat recovery, steam traps, electrical energy usage. Field trip to view equipment and use of instrumentation on the boilers at the three power plants on NCSU campus.

MAE 407 Steam and Gas Turbines. *Preqs: MAE 302; 308 or MAE 355. 3(3-0) S.* Fundamental analysis of the theory and design of turbo machinery flow passages; control and performance of turbomachinery; gas-turbine engine processes.

MAE 408 Internal Combustion Engine Fundamentals. *Preq: MAE 302. 3(3-0) F.* Fundamentals common to internal combustion engine cycles of operation. Otto engine: carburetion, combustion, knock, exhaust emissions and engine characteristics. Diesel engine: fuel metering, combustion, knock, and performance. Conventional and alternative fuels used in internal combustion engines.

MAE 410 Convective Heat Transfer and Fluid Flow. *Preqs: MAE 301, MAE 308; Coreq: MAE 310. 3(3-0) F,S,Sum.* Integration of principles and concepts of thermodynamics, fluid mechanics, and heat transfer to the development of practical convective heat transfer and mass transport relations relevant to mechanical engineering. Typical applications include boilers, condensors, piping, pumps, and heat exchangers.

MAE 411 Machine Component Design. *Preqs: MAE 315, MAE 316. 3(3-0) F.* Application of the principles of solid mechanics and material science to the analysis and design of specific machine components including screws, bearings, gears, transmission devices, brakes, clutches, couplings, fly wheels, cams, etc.

MAE 412 Energy Systems. *Preqs: MAE 302, MAE 310 and senior standing in MAE; Coreq: MAE 410. 3(3-0) F,S.* Applications of thermodynamics, fluid mechanics, and heat transfer to energy systems with emphasis on design and computer modeling. Analyses of compressible flow and combustion. Design of heat exchangers and other power system components. Economic analyses and design optimization. Operating characteristics of gas turbines, diesel engines, and central power stations. Environmental impact of power generation. Nuclear fuels and nuclear plant components.

MAE 415 Mechanical Engineering Analysis. *Preqs: MAE 302, 308, 310, 315, 316, ECE 331, and senior standing in ME. 3(3-0) F,S.* A logical method of problem solving through the integration of the physical sciences, engineering sciences and mathematics. Training in methods of analysis of real mechanical engineering problems.

MAE 416 Mechanical Engineering Design. *Preqs: MAE 302, 308, 310, 315, 316, ECE 331, and senior standing in ME. 4(3-2) F,S.* Applying engineering and materials sciences to the total design of mechanical engineering components and systems. Consideration of the design process including feasibility study, preliminary detail design, cost effectiveness over life of system along with development and evaluation of prototype through design team project activity.

MAE 421 Principles of Solar Engineering. *Preqs:* A grade of C or better in MAE 301, MAE 308, senior standing in engineering. 3(3-0) S. Principles of solar radiation, heat transfer and fluid mechanics as applied to the utilization of solar energy. A study of active and passive systems, thermal storage and energy conversion devices. Component and system design for active and passive systems along with methodologies for economic evaluation.

MAE 435 Principles of Automatic Control. *Preq: MA 341. 3(3-0) F,S.* Study of linear feedback control systems using transfer functions. Transient and steadystate responses. Stability and dynamic analyses using time response and frequency response techniques. Compensation methods. Classical control theory techniques for determination and modification of the dynamic response of a system. Synthesis and design applications to typical mechanical engineering control systems. Introduction to modern control theory.

MAE 442 Automotive Engineering. *Preq: Senior in MAE. 3(3-0) S.* Fundamental aspects of automotive engineering. Examines various automotive systems (engine, brakes, etc.) as well as their interactions in such areas as safety and performance. Current practices and development for the future.

MAE 452 Aerodynamics of V/STOL Vehicles. *Preq: MAE 356. 3(3-0).* Introduction to the aerodynamics and performance of vertical and short take-off and landing vehicles. High lift devices. The aerodynamics of propellers and rotors. Helicopter aerodynamics.

MAE 453 Introduction to Space Flight. *Preq: PY 205; MA 341 or MA 303. 3(3-0) F.* Fundamental aspects of space flight: applications of two-body orbital mechanics including earth satellites, orbital and interplanetary transfers and velocity budgets; the solar-system; propulsion system characteristics; space vehicle and booster performance, sizing, and staging; and atmospheric reentry.

MAE 455 Boundary Layer Theory. *Preq: MAE 355. 3(3-0) F.* Introduction to the Navier-Stokes Equations and boundary layer approximations for incompressible flow. Calculation techniques for laminar and turbulent boundary layer parameters which affect lift, drag, and heat transfer on aerospace vehicles. Discussions of compressible flows.

MAE 456 Computational Methods in Aerodynamics. *Preqs: CSC 302 and MAE 455. 3(3-0) Alt. S.* Introduction to computational methods for solving exact fluid equations. Emphasis on development of the fundamentals of finite difference methods and their application to viscous and inviscid flows.

MAE 462 Flight Vehicle Stability and Control. *Preqs: MAE 261, 435. 3(3-0) F.* Logitudinal, directional and lateral static stability and control of aerospace vehicles. Lineralized dynamic analysis of the motion of a six degree-of-freedom flight vehicle in response to control inputs and disturbance through use of the transfer function concept. Control of static and dynamic behavior by vehicle design (stability derivatives) and/or flight control systems.

MAE 465 Propulsion II. *Preq: MAE 365. 3(3-0) F.* Performance analysis and design of components and complete air-breathing propulsion systems.

MAE 466 Propulsion II Laboratory. *Preqs: MAE 365, MAE 357; Coreq: MAE 465. 1(0-3) F.* Laboratory work in the material covered in MAE 365 and MAE 465.

MAE 472 Aerospace Vehicle Structures II. *Preq: MAE 371. 3(3-0) S.* A continuation of MAE 371; deflection of structures, indeterminate structures, minimum weight design, fatigue analysis and use of matrix methods in structural analysis. Selection of materials for aircraft construction based on mechanical, physical, and chemical properties.

MAE 473 Aerospace Vehicle Structures II—Laboratory. *Preq: MAE 371; Coreq: MAE 472. 1(0-3) S.* Demonstration and application of the theory and concepts presented in MAE 371 and MAE 472; i.e., use of resistance strain gages, load-deflection test of typical flight vehicle structural components, and correlation of test and analytical results.

MAE 478 Aerospace Vehicle Design I. *Preqs: MAE 356, 472, senior standing in AE; Coreqs: MAE 462, 465. Available only to seniors in the Aerospace Engineering Curriculum. 2(1-3) F.* A synthesis of previously acquired theoretical and empirical knowledge and application to the design of practical aerospace vehicle systems.

MAE 479 Aerospace Vehicle Design II. *Preq: MAE 478. 3(1-6) S.* A continuation of MAE 478. Alternate designs analyzed to determine a near-optimal one which best satisfies the mission requirements. Detail design performed on major components of the vehicle system.

MAE 495 Special Topics in Mechanical and Aerospace Engineering. *Preq: Consent of instructor. 1-3 F,S,Sum.* Offered as needed to present new or special MAE subject matter.

Selected 500-Level Courses Open To Advanced Undergraduates

MAE 501 Advanced Engineering Thermodynamics. *Preqs: MAE 302; MA 401 or MA 511. 3(3-0) F.*

MAE 503 Advanced Power Plants. *Preq: MAE 412. 3(3-0) F.*

MAE 504 Fluid Dynamics of Combustion I. *Preqs: MAE 301, MAE 355 or MAE 308. 3(3-0) F.*

MAE 505 Heat Transfer Theory and Applications. *Preq: MAE 410 or equivalent. 3(3-0) F.*

MAE 506 Advanced Automotive Energy Systems. *Preq: MAE 408. 3(3-0) S.*

MAE 510 Effects of Noise and Vibration on Man. *Preqs: Sr. standing in Engineering, MA 301. 3(3-0) Alt. F.*

MAE 513 Vibration of Mechanical and Structural Components. *Preq: MAE 315 or 472. 3(3-0) F.*

MAE 514 Industrial Noise Control. *Preq: MAE 315. 3(2-3) S.*

MAE 517 Instrumentation in Sound and Vibration Engineering. *Preq: ECE 331; Coreq: MAE 513. 3(3-0) S.*

MAE 518 Acoustic Radiation I. *Preqs: MA 341 and MAE 308 or MAE 356. 3(3-0) F.*

MAE (IE) 520 Industrial Robotics. *Preqs: IE 351 or 485; MA 341 or 303. 3(3-0) F.*

MAE 525 Advanced Flight Vehicle Stability and Control. *Preq: MAE 462. 3(3-0) F.*

MAE 526 Inertial Navigation Analysis and Design. *Preq: MAE 435 or 462. 3(3-0) S.*

MAE (MAT) 531 Materials Processing by Deformation. *Preq: Six hours of solid mechanics and/or materials. 3(3-0) F.*

MAE (MAT) 532 Fundamentals of Metal Machining Theory. *Preq: Six hours of solid mechanics and/or materials. 3(3-0) S.*

MAE 533 Finite Element Analysis of Mechanical and Aeronautical Systems I. *Preq: MAE 316 or MAE 472. 3(3-0) S.*

MAE 534 Finite Element Analysis of Mechanical and Aeronautical Systems II. *Preq: MAE 533. 3(3-0) S.*

MAE 535 Experimental Stress Analysis. *Preq: MAE 316 or 371. 3(2-3) F.*

MAE 536 Photoelasticity. *Preq: MAE 316 or 371. 3(2-3) S. Alt. yrs.*

MAE 540 Advanced Air Conditioning Design. *Preqs: MAE 403, 404. 3(3-0) S.*

MAE 541 Advanced Machine Design I. *Preq: MAE 416. 3(3-0) F.*

MAE 542 Mechanical Design for Automated Assembly. *Preq: Grad. standing or PBS status in engineering. 3(3-0) F.*

MAE 550 Foundations of Fluid Dynamics. *Preqs: MAE 301, MAE 355 or MAE 308. 3(3-0) F.*

MAE 551 Airfoil Theory. *Preq: MAE 355. 3(3-0) S.*

MAE 552 Transonic Aerodynamics. *Preq: MAE 356. 3(3-0) S.*

MAE 553 Compressible Fluids. *Preq: MAE 356 or MAE 431 or MAE 550. 3(3-0) Alt. F.*

MAE 554 Hypersonic Aerodynamics. *Preq: MAE 356. 3(3-0) F.*

MAE 555 Aerodynamic Heating. *Preq: MAE 356. 3(3-0) F.*

MAE 556 Mechanics of Ideal Fluids. *Preq: MAE 355 or MAE 308. 3(3-0) S.*

MAE 557 Dynamics of Internal Fluid Flow. *Preq: MAE 356 or MAE 308. 3(3-0) F.*

MAE 558 Plasmagasdynamics I. *Preqs: MAE 356, PY 414. 3(3-0) F.*

MAE 559 Molecular Gas Dynamics I. *Preq: MAE 550. 3(3-0) F.*

MAE 560 Computational Fluid Mechanics and Heat Transfer. *Preqs: MA 501 or 512, MAE 550 or 557. 3(3-0) S.*

MAE 561 Wing Theory. *Preq: MAE 551. 3(3-0) S. Alt. yrs.*

MAE (ECE) 565 Gas Lasers. *Preqs: MAE 356 or equivalent, PY 407. 3(3-0) F.*

MAE 570 Theory of Particulate Collection in Air Pollution Control. *Preq: Grad. standing. 3(3-0) S.*

MAE 586 Project Work in Mechanical Engineering. *1-6 F,S.*

MAE 589 Special Topics in Mechanical Engineering. *Preq: Advanced undergrad. or grad. standing. 3(3-0) F,S.*

MATERIALS SCIENCE AND ENGINEERING

MAT 200 Mechanical Properties of Structural Materials. *Preqs: CH 101 and the first course in engineering mechanics. 3(2-3) F,S.* An introduction to the atomic and grain structure of structural materials and their properties with emphasis on mechanical properties of metals; plastic deformation, cold and hot working and heat treatment of metals and alloys; residual stresses, fatigue, creep and corrosion phenomena; structural polymers and composites; physical examination and nondestructive testing of materials and structural components.

MAT 201 Structure and Properties of Engineering Materials. *Preq: CH 101. 3(3-0) F,S.* Introduction to the fundamental physical principles governing the structure and constitution of metallic and nonmetallic materials and the relationships among these principles and the mechanical, physical and chemical properties of engineering materials.

MAT 210 Experiments in Materials Engineering. *Coreq: MAT 201. 1(0-3) S.* Experiments designed to familiarize students with techniques of materials examination and demonstrate basic principles of materials behavior.

MAT 301 Equilibrium and Rate Processes. *Coreqs: MA 241; MAT 201. 3(3-0) S.* Application of thermodynamic and kinetic principles to engineering materials in the liquid and solid states. DAVIS

MAT 311 Ceramic Processing I. *Preq: MAT 201. 3(2-1) S.* Science and technology of ceramic raw materials; formulations; particle size reduction, separation and characterization; particle packing, mixing, blending and agglomeration; surface properties; rheology of liquid-solid and solid-polymer systems; and forming processes. Process requirements for different ceramic raw materials and formulations.

MAT 321 Phase Transformations and Diffusion. *Preq: MAT 330. 3(3-0) S.* Types, mechanisms, and kinetics of solid state phase transformations are presented with selected applications of solid state transformations and correlations of phases with properties of materials. Mechanism of diffusion and techniques for diffusion calculations.

MAT 324 Polymer Characterization Laboratory. *Coreq: MAT 325. 1(0-3) F.* Polymer synthesis, molecular weight measurement, microscopic examination of polymers, measurement of thermal and mechanical properties, swelling, and permeability. BALIK

MAT (CHE) 325 Introduction to Polymeric Materials. *Preqs: CH 107, MAT 301; Coreq: MAT 324. 4(4-0) F.* Fundamental concepts in polymer science and engineering including: polymer chemistry, synthesis, physical structure, morphology, structure-property relationships, mechanical and thermal behavior, processing, and applications. BALIK

MAT 330 Principles of Materials I. *Preq: MAT 301. 3(3-0) F.* Structure of engineering materials from electronic to atomic and crystallographic considerations. Structural imperfections and their effects on properties. Applications of thermodynamic principles to the construction and use of phase diagrams in materials systems. Development of and correlation of microstructure with phase diagrams. PORTER

MAT 331 Principles of Materials II. *Preq: MAT 330. 3(3-0) S.* Electrical and magnetic properties of those structures studied in Principles of Materials I including dielectric, piezoelectric, ferromagnetic, and ferrimagnetic (ferrites) behavior; interactions of electromagnetic radiation with engineering materials; thermal properties, optical properties, luminescence. PORTER

MAT 332 Principles of Materials III. *Preqs: MAT 321 and 331. 3(3-0) F.* Practical methods for making quantitative estimates of changes in materials properties due to changes in composition, structure, and local environment. Metallic, ceramic, polymeric and electronic bulk materials and materials surfaces are treated. The use of computer modeling. BEELER

MAT 400 Metallic Materials in Engineering Design. *Preq: MAT 200 or 201. Not acceptable for MTE students. 3(3-0) F,S.* Relationship of microstructure to the properties of materials. Control of microstructure to meet engineering design requirements.

MAT (NE) 409 Nuclear Materials. *Preq: MAT 201. 2(2-0) S.* Materials used in nuclear reactors-pertinent factors in selection and utilization of the materials, and the effects of radiation on their physical, chemical and mechanical properties. MURTY

MAT 410 Computer Applications for Materials Engineering. *Preqs: CSC 111; Coreq: MAT 330. 3(3-0) F.* Computer techniques for processing materials data and performing materials design and analysis calculations. BEELER

MAT 417 Ceramic Engineering Design. *Preq: MAT 311. 3(3-0) S.* Individual and team study involving the interdependence of plant layout, processes, equipment and materials in the economic design of ceramic engineering systems and subsystems. Discussion of design principles, sources of data, creativity, and economic analysis to encourage original solutions to problems of current and future need and interest in the ceramic professionPALMOUR

MAT 423 Introduction to Materials Engineering Design. *Preq: MAT 435, 434, 450 and senior standing in MTE; Coreq: 431, MAT 430. 3(3-0) F.* Problem solving in materials engineering design through effective utilization of statistics, computer graphics, spreadsheets, and other tools of the trade. Through participatory involvement in modular design syntheses and analyses, provides broad exposure to engineering design issues; special emphasis on materials selections, relevant process sensitivities, and resultant end-use properties. First of two courses in materials engineering design to be followed by MAT 424.

MAT 424 Materials Science and Engineering Design Project. *Preq: MAT 423, 430, 431, 435, 434, 450 and senior standing. 3(1-6) S.* Design project in materials science and engineering requiring problem definition and analysis, synthesis, and presentation of a designed solution. Students work in groups with a faculty adviser on problems submitted by local industrial sponsors or emerging research issues that represent the major specialty areas including ceramics, metals polymers, or electronic materials.

MAT 430 Physical Metallurgy Laboratory. *Coreq: MAT 431. 1(0-3) F.* Laboratory experiments dealing with the mechanical properties and structure of ferrous and non-ferrous metals.

MAT 431 Physical Metallurgy I. *Preq: MAT 321, 450; Coreq: MAT 430. 4(4-0) F.* Application and design of selected ferrous and non-ferrous alloys in a theoretical and a practical context. Factors which improve resistance to fatigue failure, creep failure, corrosion, oxidation and brittle fracture. Iron-, aluminum-, copper-, nickel- and titanium-base alloys.

MAT 432 Physical Metallurgy II. *Preq: MAT 431. 3(3-0) S.* Application and design of alloys for a particular use in a theoretical and a practical context. Alloy systems considered: cast irons, stainless steels and tool steels, cobalt- and magnesium-base alloys, refractory metals, heavy metals and precious metals. Surface treatments, electrometallurgy, oxidation and corrosion.

MAT 434 Ceramic Engineering Laboratory. *Coreq: MAT 435. 1(0-3) S.* Processing of ceramic materials. Two compositions will be processed from raw materials to finished products. Evaluations made after each processing step. Effects of composition, equipment design, and processing conditions on properties in the fired ware.

MAT 435 Physical Ceramics I. *Coreqs: MAT 321, MAT 434. 3(3-0) S.* Physical and chemical nature of classical and newly discovered ceramic materials. Thermodynamics, crystal structure, structural imperfections, phase transformations and microstructure and their collective effects on thermal, elastic and strength properties.

MAT 436 Physical Ceramics II. *Preq: MAT 435. 3(3-0) S.* A continuation of MAT 435 with emphasis on the integrated effects of crystalline structure, structural imperfections and microstructure on plastic deformation and creep and on the optical, dielectric, electronic and magentic properties of ceramic materials. KINGON

MAT 440 Processing of Metallic Materials. *Preqs: MAT 321, MAT 450; Coreq: MAT 431. 3(3-0) F.* Fundamental concepts of solidification and their application to foundry and welding practices; metal forming concepts applied to forging, rolling, extrusion, drawing, and sheet forming operations; machining mechanisms and methods; powder metallurgy; advanced processing methods including rapid solidification and mechanical alloying.

MAT 450 Mechanical Properties of Materials. *Preqs: MAT 325 and 330; MAE 314. 3(3-0) S.* Elastic, plastic, and fracture or failure phenomena in solids treated in terms of fundamental deformation mechanisms and the role of microstructure. Tensile, creep, fatigue and viscoelastic modes of deformation and design considerations.

MAT 460 Microelectronic Materials. *Preqs: MAT 332. 3(3-0) S.* Processes and problems relevant to microelectronic materials technology. Boule growth, wafer preparation, epitaxial growth, doping techniques and device applications of elemental, binary and ternary compound semiconductors. Electrical, optical and chemical characterization of semiconductors and materials considerations relevant to device fabrication, bonding and packaging. ROZGONYI

MAT 490 Special Topics in Materials Engineering. *Preq: Permission of Instructor. 1-4.* Offered as needed for the development of new courses in materials engineering, including areas such as metals, ceramics, polymers, or microelectronic materials.

MAT 491 Materials Engineering Seminar. *Preq: Sr. standing. 1(1-0) F,S.* Survey of selected topics and professional aspects of materials science and engineering. Written and oral reports by students and presentations by faculty and guest lecturers.

MAT 495 Materials Engineering Projects. *Preq: Jr. or sr. standing. 1-6 F,S.* Application of engineering principles to a specific materials engineering project by a student or small group of students under supervision of a faculty member. A written report required.

Selected 500-Level Courses Open To Advanced Undergraduates

MAT 500 Modern Concepts in Materials Science. *Preq: Grad. Standing or CI. 3(3-0) F.*

MAT 502 Defects in Solids. *Preq: CI. 3(3-0) Sum.*

MAT 504 Electrical, Optical and Magnetic Properties of Materials. *Preqs: MAT 331, MAT 500 and 510 or CI. 3(3-0) S.*

MAT 508 Thermodynamics of Materials. *Preq: MAT 301 or equivalent. 3(3-0) F.*

MAT 510 Elements of Crystallography and diffraction. *Preq: MAT 332; Coreq: MAT 500 or CI. 3(3-0) F.*

MAT 511 Stereology and Image Analysis. *Preq: Grad Standing or CI. 3(3-0) S. Alt. yrs.*

MAT 512 Scanning Electron Microscopy. *Preq: Grad. Standing or CI. 3(3-0) F.*

MAT (MAE) 531 Materials Processing by Deformation. *Preq: Six hours of solid mechanics and/or materials. 3(3-0) F.*

MAT (MAE) 532 Fundamentals of Metal Machining Theory. *Preq: Six hours of solid mechanics and/or materials. 3(3-0) F.*

MAT 533 Advanced Ceramic Engineering Design. *Preqs: MAT 417, 435. 3(2-3) F.*

MAT 556 Composite Materials. *Preq: MAT 450. 3(3-0) F.*

MAT 560 Materials Science and Processing of Semiconductor Devices. *Preq: MAT 460. 3(3-0) S.*

MAT 595 Advanced Materials Experiments. *Preq: Sr. or grad. standing. 1-3.*

MICROBIOLOGY

MB 200 Microbiology and World Affairs. *3(3-0) S.* An integrated and comprehensive study of the microbial world and its influence on global events and human affairs.

MB 401 General Microbiology. *Preqs: BS 100, CH 223 or 220. 4(3-3) F,S.* Rigorous introduction to basic principles of microbiology. Designed for students in biological and agricultural sciences and for all students planning to take further courses in microbiology.

MB (FS) 405 Food Microbiology. *Preq: MB 401. 3(2-3) F.* (See Food Science.)

MB 411 Medical Microbiology. *Preq: MB 401. 4(3-3) S.* Comprehensive study of microbial pathogenesis and host resistance. Diagnosis, prevention, and therapy of common diseases of microbial origin. Laboratory practice in clinical bacteriology, immunology and virology. LUGINBUHL

MB 490 Seminar in Microbiology. *Preqs: MB 401 and senior standing. 1(1-0) F.* Students research, prepare and orally present current topics in all areas of microbiology. Emphasis on new developments and technologies, and in preparing for careers and further study.

MB 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

MB 493 Special Problems in Microbiology. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

MB 495 Special Topics in Microbiology. *1-3 F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

Selected 500-Level Courses Open To Advanced Undergraduates

MB 514 Microbial Metabolic Regulation. *Preqs: MB 401, BCH 451 or BCH 551. 3(3-0).*

MB (SSC) 532 Soil Microbiology. *Preqs. MB 401; CH 220 or CI. 4(3-3) S.*

MB (ZO) 555 Protozoology. *Preq: CI. 4(2-6) S. Alt. odd.*

MB (BAE, CE) 570 Sanitary Microbiology. *Preq: MB 401 or equivalent. 3(2-3) S.*

MB (BO) 574 Phycology. *Preq: BS 100 or BO 200. 3(1-4) S.*

MB (BO, PP) 575 The Fungi. *Preq: BO 200 or equivalent. 3(3-0) F.*

MB (BO, PP) 576 The Fungi-Lab. *Coreq: BO 575. 1(0-3) F.*

MULTIDISCIPLINARY STUDIES

MDS (UNI) 101 Introduction to University Education I. *1(1-1) F, S.* Developmental and academic topics to assist students in making rational decisions about majors.

MDS (UNI) 102 Introduction to University Education II. *Preq: UNI 101. 1(1-1) S.* Scope and objectives of NCSU programs of study. Exploration of schools and departments through faculty lectures and individual projects. Career opportunities and decision-making strategies.

MDS (UNI) 103 Images of the Future. *Preq: University Undesignated Freshmen status. 3(3-0) F.* Basic principles of futures studies; history, problems, limitations, and methods of forecasting; questions of change, quality of life, complexity, technology, and values.

MDS (UNI) 104 The Experience and Interpretations of Freedom. *Preq: University Undesignated Freshmen status. 3(3-0) F,S.* Interdisciplinary introduction to freedom as a basic theme in history, culture, and personal life. Focus on interplay between the experience of freedom and its various interpretations.

MDS (UNI) 105 A Systems Approach to the Universe. *3(3-0) S.* Systems approaches to problems in physical, social, and behavioral sciences and technology. Concepts of general systems (interactions between systems functioning). Emphasis in interdisciplinary problem solving methods and critical questioning.

MDS (UNI) 201 Environmental Ethics. *3(3-0) F,S.* Interdisciplinary consideration of ways in which field of study coupled with personal/cultural values contribute towards either solving or compounding environmental problems; provides framework for process of making ethical decisions. MALLOY-HANLEY

MDS (UNI, PEH) 211 Alcohol Use and Abuse. *3(3-0) F,S.* The history of human involvement with alcohol is reviewed. Physiological, cultural, sociological, and psychological aspects of drinking alcohol are explored. Responsible use patterns; chronic abuse; current educational, prevention, and rehabilitation areas are explored. Students will have the option to develop peer helper skills during the course.

MDS (UNI, PEH) 212 Drug Abuse and Human Behavior. *3(3-0) F,S.* Review of substance use and abuse. Discussion of pharmacological, physical, psychological and socioeconomic components of addiction and its treatment. Trends in attitudes and intervention/prevention programs will be explored.

MDS (UNI) 220 Oceans: Our Continuing Frontier. *3(3-0) F.* Interdisciplinary approach to current issues, scientific concepts, literature and future trends concerning the oceans. Required weekend field trip. SPENCE

MDS (UNI) 240 Introduction to African-American Studies. *3(3-0) F,S.* An interdisciplinary study of Sub-Saharan Africa, its arts, culture, and people, and of the African-American experience. HAMMOND

MDS (UNI) 295 Special Topics in University Studies. *1-6 F,S.* Detailed investigation of an interdisciplinary topic. Topic and mode of study to be determined by faculty member and/or teaching team.

MDS (UNI) 301 Science and Civilization. *Preq: Soph. standing. 3(3-0) F,S.* An inquiry into the scientific achievement and cultural impact of three different, but interrelated, models (or paradigms) of understanding the world and man's place in it; the Ancient-Medieval model of Aristotle, Ptolemy and Aquinas; the 17th century model of Newtonian physics; and the emerging, but fragmentary, 20th century model based upon the "new physics" of Einstein, Planck and Heisenberg.
HOFFMAN, MALLOY-HANLEY, RICE, STALNAKER

MDS (UNI) 302 Contemporary Science and Human Values. *Preq: Soph. standing. 3(3-0) F,S.* An interdisciplinary evaluation of recent and potential influences of current scientific-technological developments on society. Emerging social, ethical, and intellectual issues include: the adequacy of contemporary scientific frameworks; the relations among science, technology, and society; the social consequences of scientific applications; and human prospects and possibilities. GRIMES, HOFFMAN, KORTE

MDS (UNI) 303 Humans and the Environment. *3(3-0) F,S.* An interdisciplinary examination of the effects of human population growth and of humanity's increasing utilization of the earth's finite resources along with the major environmental problems thus produced. Attention is focused upon the inputs required for environmental decision-making and environmental problem solving. Possible choices for developing an ecologically sound and humane future explored. ADAMS

MDS (UNI) 320 Ethics in Engineering. *Preq: Junior standing. 3(3-0) S.* Engineering in American culture and the emerging ethical issues confronting the profession: corporate responsibility, personal rights, whistle blowing, conflicts of interest, advertising, corporate disclosure, professional autonomy, risk assessment, and the place and purpose of Engineering codes of ethics. STALNAKER

MDS (UNI) 323 World Population and Food Prospects. *3(3-0) S.* Examination of the dynamics of population size and food needs, production, distribution and utilization. Consequences of inadequate nutrition and food choices, efforts to increase the compatability of effective food production systems and alternate crops and cropping systems examined. PATTERSON

MDS (UNI) 324 Alternative Futures. *3(3-0) F,S.* Possible alternative futures and the cutting edge of the present in perspective. Special emphasis on the nature and likelihood of various alternatives, the methodology and limitations of forecasting, selected futurist issues, and the interactions between present and possible technologies and human values. HOFFMAN

MDS (UNI) 325 Bio-Medical Ethics: An Interdisciplinary Inquiry. *3(3-0) F.* An interdisciplinary examination and appraisal of emerging ethical and social issues resulting from recent advances in the biological and medical sciences. Abortion, euthanasia, consent, truth-telling, confidentiality, paternalism, genetic engineering and behavior control. Focus on factual details, value questions, the interplay of fact and value, assessment of impacts, and questions of policy formulation. STALNAKER

MDS (UNI) 326 Technology Assessment. *3(3-0) S.* Impacts of technologies as they are applied in society. Description and forecasting of effects, interactions, and potential irreversibilities. HOFFMAN

MDS (UNI) 327 Modern Art-Modern Literature: 1880-1980. *3(3-0) S.* Interrelationship of art and literature, 1880-1980, from classic Modern movements to contemporary Post-modern movements; major figures, such as Picasso, Ernst, Magritte, De Kooning, Warhol, and Kiefer in art and O'Neill, Woolf, Faulkner, Beckett, Sartre, and Vonnegut in literature.

MDS (UNI, PEH) 334 Human Sexuality. *3(3-0) F,S,Sum.* Historical and cultural background of human sexuality. Physiological and psychological aspects of sexual response and reproduction. Development of sexual values. Birth control. Sexually transmitted diseases. Gender acquisition. Legal and moral issues. Appraisal of place and significance of sexuality in contemporary American culture.

MDS (UNI) 401 The Contemporary City: Problems and Prospects. *3(3-0) S.* An interdisciplinary examination of the social and physical characteristics of the contemporary city and the problems which cities face. Topics will include urban design, social relationships, education, transportation, crime and violence and urban psychology. Alternative solutions to various urban problems will be discussed. KORTE

MDS (UNI) 402 Peace and War in the Nuclear Age. *3(3-0) F.* An interdisciplinary examination of contemporary wars and international conflicts, arms races, nuclear strategy and defense policy, arms control, and theories of peace.

MDS (UNI) 403 Seminar in Technology and Society. *Preq: Sophomore standing. 3(3-0) S. Alt. yr.* Exploration of the phenomenon of technology in society. The nature of technology, policy issues, the question of values, technological forecasting, and the implications of future technologies.

MDS (UNI) 405 Technology and American culture. *3(3-0) F,S.* An interdisciplinary study of the role of technology in American culture which examines the ideological, political, social, economic, and institutional contexts of technological change from the 1760's to the present, and explores the cultural impacts of new technolgical systems.

MDS (UNI) 410 Toxic Substances and Society. *Preq: Junior standing. 3(3-0) S.* An interdisciplinary evaluation of the past, present and future human health effects of toxic substances at work, at home, and through our food. The political, economic and ethical dimensions of toxic substances and ways of minimizing their adverse effects. GRIMES

MDS (UNI) 412 Entering the 21st Century: Agricultural, Technological & Environmental Perspectives. *3(3-0) F.* Systems approach to predictions about the world in the year 2000 from the perspectives of agricultural and environmental studies. Attention to food production, fisheries, forests, water, energy, material resources for fuel, climate, and population. Guest lectures and class projects.

MDS (UNI) 490 Issues in Science, Technology and Society. *Preq: Junior standing. 3(3-0) F,S.* Examination of a significant issue, method, or historical episode in the area of science, technology, and society. Toward end of term, the seminar will meet with a University Symposium on the same subject as the seminar.

MDS (UNI) 495 Special Topics in University Studies. *1-6 F,S.* Examination of selected topics of an interdisciplinary nature.

MDS (UNI) 496 Topics in Film and Interdisciplinary Studies. *3 (4-0) F,S.* Detailed examination of film within interdisciplinary contexts. Specific topics will vary from semester to semester.

MDS (UNI) 498 Independent Study in University Studies. *Preq: Permission of instructor. 1-3 F,S.* Independent investigation and discussion of a selected topic of an interdisciplinary nature.

Selected 500-Level Courses Open To Advanced Undergraduates

MDS (UNI, FOR) 584 The Practice of Environmental Impact Assessment. *4(0-8) F.*

MDS (UNI) 595 Special Topics in University Studies. *Preq: Grad. standing or CI. 1-3 F,S.*

MARINE, EARTH AND ATMOSPHERIC SCIENCES

INTRODUCTORY COURSES IN MARINE, EARTH AND ATMOSPHERIC SCIENCES

MEA 101 Geology I: Physical. *Credit is not allowed for both MEA 101 and 120. Recommended that MEA 110 be taken concurrently. 3(3-0) F,S, Sum.* Systematic consideration of processes operating on and below the earth's surface and the resulting features of landscape, earth structures, and earth materials. Occurrences and utilization of the earth's physical resources.

MEA 102 Geology II: Historical. *Preq: MEA 101 or MEA 120. Recommended that MEA 111 be taken concurrently. 3(3-0) S.* The second semester of the basic introductory sequence in geology. Utilization of the principles of geology to reconstruct and understand the earth's history. Geologic events that cause modification of the earth's crust, emphasizing North America. History of life and the environmental significance of changes in animal and plant life through geologic time. LEITHOLD

MEA 110 Geology I Laboratory. *Coreq: MEA 101 or MEA 120. 1(0-3) F,S, Sum.* Scientific methodology applied to the study of common rock-forming minerals, common rocks, topographic maps, geologic structures and geological maps. Field trips.

MEA 111 Geology II Laboratory. *Coreq: MEA 102. 1(0-2) S.* Reconstruction and interpretation of events in the history of the earth. Interpretation of sedimentary rocks, construction and interpretation of geological maps, identification of fossil organisms and utilization of fossils in the reconstruction of earth history.

MEA 120 Elements of Physical Geology. *Credit is not allowed for both MEA 101 and 120. Recommended that MEA 110 be taken concurrently. 2(2-0).* Basic principles of physical geology. Major earth processes, principal geologic features, earth materials, and their interrelationships. Primarily intended for majors in disciplines requiring a minimum practical working knowledge of geology.

MEA 130 Introduction to Weather and Climate. *For non-majors only. 3(3-0) F,S.* Explores the structure, physical causes, and climatology of weather systems including the jet streams, mid-latitude cyclones, hurricanes, thunderstorms, and tornadoes. Clouds and precipitation, air pollution, climate modification, optical effects (rainbows, halos) and weather instruments. Weather systems and forecasting techniques are illustrated through daily weather map discussions.

MEA 135 Introduction to Weather and Climate Laboratory. *Coreq: MEA 130. 1(0-2) F,S.* Supplements material in MEA 130. Meteorological instruments; weather observations; analysis, graphical display and interpretation of data; structure of weather systems; principles of weather forecasting.

MEA 140 Natural Hazards and Global Change. *3(3-0).* The science of natural hazards and global change: the impact on human civilization of events in the lithosphere, atmosphere, biosphere, and hydrosphere (e.g., earthquakes, hurricanes, red tides, and floods), and the impact of humans on the global environment (e.g., global warming).

MEA 200 Introduction to Oceanography. *Preq: High school physics, chemistry, algebra, trigonometry and biology or equivalent. 3(3-0) F,S.* The ocean as a part of our environment including interactions between atmosphere and ocean, ocean circulation, physical and chemical properties of sea water, marine geology and marine biology.
KNOWLES, WOLCOTT

MEA 208 Introduction to Environmental Geography. *3(3-0) S, Alt. yrs.* Our physical environment; the interrelation between man and his physical environment. Topics include atmospheric, and oceanic structures and landforms. Interaction of land, sea, air and interaction of man and his environment. Use of geographic tools. CAVAROC, RIORDAN

MEA 215 Geology and Landscape of the National Parks. *2(2-0).* The geologic evolution and landscape formation of the national parks of the United States. The underlying geologic character, the processes which have changed and shaped each area through time, and the evolution of the present landscape of each of the national parks, with emphasis on the geologic uniqueness and scenic beauty of the various localities.

MEA (ZO) 220 Marine Biology. *Preq: MEA 200 or BS 100. 3(3-0) S.* An introduction to marine plants and animals, their adaptations to life in the sea and ecological interactions in selected marine environments (e.g. coral reefs, deep sea, salt marshes). Interactions of man with the sea: food from the seas, biology of diving. Weekend field trip required.
WOLCOTT

ADVANCED COURSES: EARTH SCIENCE (GEOLOGY/GEOPHYSICS)

MEA 300 Environmental Geology. *Preq: MEA 120 or MEA 101 or SSC 200. 3(3-0).* Geologic aspects of the environment; man's effect upon and interaction with the various geologic processes; geologic considerations involved in land use planning, waste disposal, and effective use of the earth's natural resources; geologic risks and hazards. WELBY

MEA 329 Elements of Crystallography and Mineralogy. *Preq: MEA 101 or MEA 120; CH 101; MEA 110. Credit for both MEA 329 and MEA 330 is not allowed. 2(2-0) F.* Elements of morphological crystallography. Space lattices, crystal symmetry, systems and classes. Stereographic projection of common forms. Chemical composition, varieties, occurrence, associations, important localities and uses. Crystal structures of selected minerals. Identical to MEA 330, except that there is no laboratory. SPEER

MEA 330 Crystallography and Mineralogy. *Preq: MEA 101 or 120; Coreqs: CH 101, MEA 110. 3(2-3) F.* The elements of morphological crystallography. Space lattices, crystal

symmetry, systems and classes. Stereographic projection of common forms. Identification of minerals by crystallographic features, cleavage, fracture, luster, color, streak, hardness, specific gravity, etc. Chemical composition, varieties, occurrence, associations, important localities and uses. Crystal structures of selected minerals. SPEER

MEA 331 Optical Mineralogy. *Coreq: MEA 330 (Recommended that MEA 330 be taken concurrently.) 2(1-2) F.* Identification of the non-opaque rock-forming minerals with the polarizing microscope. Determination of the optical properties of isotropic, uniaxial, and biaxial minerals, including refractive indices, birefringence, optic sign, and orientation. Emphasis on petrographic thin sections. STODDARD

MEA 415 Geology of Economic Mineral Deposits. *Preq: MEA 330; MEA 440 and 450 recommended. 3(2-3) S. Alt. Yrs.* The nature, geologic setting and geographic distribution of economic mineral deposits. Topics include both metallic and industrial minerals and the various geologic processes that work to produce them. Laboratory work with economic mineral suites from famous mining districts of the world. Two to three weekend field trips required.

MEA 439 Elements of Igneous and Metamorphic Petrology. *Preq: MEA 329. Credit for both MEA 439 and MEA 440 is not allowed. 3(3-0) S.* Rocks formed by the crystallization of magmas (igneous) at the surface and subsurface and by the solid-state recrystallization of existing rocks (metamorphic). Origins of these rocks and related geologic processes interpreted within the framework of plate tectonics, whole-rock and mineral chemistry, and phase equilibria. Identical to MEA 440, except that there is no laboratory. FODOR

MEA 440 Igneous and Metamorphic Petrology. *Preq: MEA 331. 4(3-3) S.* Rocks formed by the crystallization of magmas (igneous) at the surface and subsurface and by the solid-state recrystallization of existing rocks (metamorphic). Origins of these rocks and related geologic processes interpreted within the framework of plate tectonics, whole-rock and mineral chemistry, and phase equilibria. Identification, classification, microscopy, mineralogy. FODOR

MEA 450 Introductory Sedimentary Petrology/Stratigraphy. *Coreq: MEA 331. 4(3-3) F.* Identification, classification, geologic occurrence, and origin of minerals and rocks formed by physical, chemical and biological processes at and near the earth's surface. Principles of divisions of stratified terrains into natural units, correlation of strata, interpretation of depositional environments and facies. Required field trips. CAVAROC

MEA 451 Structural Geology. *Preqs: MEA 101 or 120; MEA 110. 4(3-3) S.* Basic principles of rock mechanics; stress-strain analysis of deformed rocks. Nature and mechanisms of formation of joints, cleavage, faults, folds and other structural features of the earth's crust. Introduction to geotectonics. Required overnight field trips. HIBBARD

MEA 461 Engineering Geology. *Preqs: MEA 101 or 120. 3(3-0).* Geologic and geotechnical engineering principles and techniques for engineering projects. Identification of important material properties and methods of determining these properties. Case studies presented. WELBY

MEA 465 Geologic Field Camp I. *Preqs: MEA 440, 450, 451. First part of six weeks out-of-state summer field camp. Both MEA 465 and MEA 466 must be taken in the same summer. 3, Sum.* Geological field instruments and techniques. Geological field mapping of various geologic structures and terrains within areas of little deformed sedimentary strata. Additional fees required.

MEA 466 Geologic Field Camp II. *Preq: MEA 465. Second part of six weeks out-of-state summer field camp. Both MEA 465 and MEA 466 must be taken in the same summer. 3 cr. Sum.* Advanced geologic field techniques. Geologic field mapping in areas of complexly deformed volcanic and metamorphic rocks. Regional field trip away from field camp. Additional fees required.

MEA 468 Invertebrate Paleontology and Biostratigraphy. *Preqs: MEA 102 and MEA 111; or ZO 302. 4(3-3) F.* Study of fossil invertebrates and their applications to problems and concepts of paleoecology, correlation of strata, evolution and broader concepts of earth history. Required field trips. SHOWERS

MEA 470 Introduction to Geophysics. *Preqs: PY 208 or 212; an introductory course in geology. 3(3-0) F.* Structure of the earth, a dynamic and evolving entity, as inferred from seismology, gravity, magnetism and heat flow. Geodynamic processes responsible for continental drift; plate tectonic theory; regional geophysics of selected areas. BEVIS

MEA 471 Exploration and Engineering Geophysics. *Preq: MEA 470 or PY 208. Credit may not be received for both MEA 471 and MEA 570. 3(3-0).* Geophysical methods as applied to exploring the earth's mineral and energy resources, and investigating subsurface geological structure and its physical properties. Principles, measurements, analyses, and interpretations of gravity, magnetic, electric, electromagnetic, seismic methods.

MEA 475 Geophysical Field Methods. *Preq: MEA 471. Credit is not allowed for both MEA 475 and MEA 575. 2 cr. Sum. field camp.* Practical geophysical field measurements using instruments for gravity, magnetic, electric, electromagnetic and radioactivity methods. Data interpretation in terms of subsurface geological structures and their physical properties, locations, sizes and shapes. Students must register for the course in the second summer session. Location: North Carolina. Estimated expense: $150.00.

MEA 476 Seismic Exploration for Oil. *Preq: PY 208, knowledge of FORTRAN. Credit is not allowed for both MEA 476 and MEA 576. 3(3-0).* A comprehensive introduction to the reflection seismic method as applied to exploring oil and gas resources. Seismic instrumentation, field data acquisition, common-depth-point method, deconvolution, digital filtering, migration, and seismic stratigraphy of hydro-carbon depositional environments, along with computer-oriented exercises.

MEA 481 Principles of Geomorphology. *Preqs: MEA 101 or MEA 120; and MEA 110. 3(2-2).* Landforms and the processes responsible for their origin. Emphasis on the geologic principles involved in interpreting the origin and evolution of various landforms, and discussion of North American geomorphic process.

MEA 491 Seminar on Selected Geologic Topics. *Preq: Senior standing in GYS, GYA, or GPY. 2(2-0) S.* Study and discussion of selected topics from the geological literature. Preparation and presentation of geological reports.

MEA 493A Special Topics in Earth Sciences. *Preq: Consent of department. 1-6 As necessary.* Directed individual study or experimental course offering.

Selected 500-Level Courses Open To Advanced Undergraduates

MEA 500 Regional Geology of North America. *Preqs: MEA 101 or 120, sr. standing. 1-6.*

MEA 510 Geological Oceanography. *Preq: MEA 450 or equivalent. 3(3-0) F.*

MEA 515 Topics in Appalachian Geology. *Preqs: MEA 440, 450 and 451. 3(3-0).*

MEA 522 Petroleum Geology. *Preq: MEA 452. 3(3-0).*

MEA 523 Introduction to Subsurface Well Evaluation. *Preqs: CH 103, PY 212, MEA 101 or 120. 3(2-3) Alt. F.*

MEA 545 Advanced Igneous Petrology. *Preq: MEA 440. 3(2-2).*

MEA 546 Advanced Metamorphic Petrology. *Preq: MEA 440. 3(2-2).*

MEA 551 Advanced Structural Geology. *Preq: MEA 451. 3(2-3).*

MEA 562 Applied Sedimentary Analysis. *Preqs: MEA 450, ST 361. 3(2-2).*

MEA 564 Depositional Environments and Lithostratigraphy. *Preq: MEA 450 or grad. standing. 3(2-3).*

MEA 565 Hydrogeology. *Preq: MEA 450. 3(3-0) Alt. S.*

MEA 567 Geochemistry. *Preq: CH 331 or 433. 3(3-0).*

MEA 570 Exploration and Engineering Geophysics. *Preq: MEA 470 or PY 208. 3(3-0).*

MEA 577 Sedimentary Geochemistry. *Preqs: CH 331 or CH 431 or MEA 567 or equivalent background. 3(3-0).*

MEA 583 Photogeology and Remote Sensing. *Preqs: MEA 101 or 120; MEA 481 or equivalent. 3(2-2).*

MEA 588 Regional Tectonics. *Preqs: MEA 440, 450, 451. 3(3-0).*

MEA 593 Special Topics. *Preq: CI. 1-6 F,S.*

ADVANCED COURSES: MARINE SCIENCE (OCEANOGRAPHY)

MEA 493B Special Topics in Marine Science. *Preq: Consent of department. 1-3 F,S.* Experiment, individualized study, or research in topics of student's interest which are not covered conveniently in the scheduled courses.

Selected 500-Level Courses Open To Advanced Undergraduates

MEA 501 Environmental Fluid Mechanics. *Preqs: MA 242, PY 208 3(3-1) F.*

MEA 510 Geological Oceanography. *Preq: MEA 450 or equivalent. 3(3-0) F.*

MEA (ZO) 520 Principles of Biological Oceanography. *Preqs: BS 100 and either BO (ZO) 360 or grad. standing. 3(3-0) S.*

MEA (CE) 541 Gravity Wave Theory I. *Preq: MAE 308 or PY 411. 3(3-0) S.*

MEA 560 Principles of Physical Oceanography. *Preqs: MA 231 and PY 212 or equivalent. 3(3-0) S.*

MEA 561 Introduction to Physical Oceanography. *Preqs: MA 341, PY 208 or CI. 3(3-0) F.*

MEA 569 The Physical Dynamics of Estuaries. *Preqs: MA 242 or 231; PY 208 or 212 or CI. 3(3-0) Alt. S.*

MEA 571 Principles of Chemical Oceanography. *Preq: CH 107 or equivalent. 3(3-0) F.*

MEA 593 Special Topics. *Preq: CI. 1-3 F,S.*

ADVANCED COURSES: ATMOSPHERIC SCIENCE (METEOROLOGY)

MEA 311 Physical Climatology. *Preqs: PY 205, 211 or 221; Coreq: MA 241 or 231. 3(3-0). F.* Physical basis for weather and climates on earth, approached from the principles of physical climatology. Solar energy incident to, and modified by, the atmosphere; terrestrial radiation; transports of heat and water substance; heat balances and imbalances. Consequences to distributions of temperature, mass, motions, and weather. DAVIS

MEA 312 Physical Meteorology. *Preqs: PY 205 or 211 or 221; Coreq: MA 241, PY 208 or PY 212. 3(3-0) S.* Principles and concepts for understanding the atmosphere and various meteorological phenomena taking place in it such as dew, frost, fog, clouds, precipitation and vertical motions, thunderstorms, tornadoes, and hurricanes. These phenomena are explained using the basic principles of thermodynamics, statics, and buoyancy. SAXENA

MEA 313 Meteorology Laboratory I. *Preq: MA 141 or 131; Coreq: PY 205 or 211 or 221. 1(0-3) F.* Supplements material in MEA 311: Surface data and analysis techniques, instrumentation, global energy budgets and transports, climatological distribution of weather variables, the structure and evolution of the mid-latitude cyclone. RIORDAN

MEA 314 Meteorological Laboratory II. *Preq: MA 141 or 131; Coreq: PY 205 or 211 or 221. 1(0-3) S.* Supplements material in MEA 312: Meteorological fields, variation of temperature with height, measurement and calculation of water-vapor, cloud processes, thermodynamics applied to stability and thunderstorms. WATSON

MEA 405 Climatological Data Analysis. *Preq: MEA311 and ST361. 3(3-0) S.* Probability and statistics applied to climatology and meteorology. Discrete and continuous probability distributions of meteorological variables examined. Regression analysis applied to weather forecasting. Forecast verification. Smoothing and filtering processes. Introduction to time series analysis. Elementary decision theory. DAVIS

MEA 412 Atmospheric Physics. *Preqs: MA 242, PY 208 or equivalent. 3(3-0) S.* Physical explanation of atmospheric aerosol, cloud and precipitation processes. Planned and inadvertent weather modification, hail suppression, hurricane modification; impact of urban-industrial pollution on weather. Atmospheric electricity. Remote sensing techniques: radar, lidar and acoustic sounder. Atmospheric optics: visibility and optical phenomena; scattering. Terrestrial and atmospheric radiation. Important processes are quantitatively analyzed. SAXENA

MEA 421 Atmospheric Dynamics I. *Preqs: MA 242, PY 208, MEA 311, 312, 313, 314. 4(3-2) F.* Atmospheric thermodynamics: composition of air; applications of elementary kinetic theory and principles of energy and mass conservation; phase change of water. Principles of atmospheric statics: altimetry, static stability. Meteorological applications of fluid kinematics: applications of vector analysis; relationships among streamlines, trajectories, and streak lines; Lagrangian and Eulerian perspectives; linear properties of atmospheric motion fields. LIN, RIORDAN

MEA 422 Atmospheric Dynamics II. *Preqs: MEA 421, 4(3-2) S.* Atmospheric dynamics: review of Newton's laws of motion; application to fluids; forces in the atmosphere, the vector equation of motion on a rotating earth; component equations in spherical coordinates; scale analysis and simplifications; vorticity; pressure coordinates; geostrophic, gradient, cyclostrophic, and inertial winds; vertical shear of the wind (thermal wind); the planetary boundary layer; introduction to dynamics of waves. LIN, RIORDAN

MEA 443 Weather Analysis and Forecasting I. *Preqs: MEA 421. 3(1-6) F.* Time and space distributions of cloud and weather systems. Sounding analysis with application to moisture distribution and aircraft icing; sounding modification processing. Vertical structure of fronts, tropopause, and jetstreams; clear air turbulence. Three-dimensional structure and evolution of pressure systems. Analysis of the wind field; calculation of kinematic properties. BUSINGER, WATSON

MEA 444 Weather Analysis and Forecasting II. *Preq: MEA 443. 3(1-6) S.* Introduction to statistical forcasting methods; applications to local forecast studies. Three dimensional structure of weather systems as revealed by isentropic analysis; applications to forecasting clouds and precipitation. Applications of quasi-geostrophic theory to understanding and forecasting cyclone motion and development; application to forecasting clouds and precipitation, severe weather analysis and forecasting. Numerical weather prediction. BUSINGER, WATSON

MEA 455 Micrometeorology. *Preq: MEA 422 or MAE 308. 3(3-0) F.* Energy budget near the earth's surface; soil temperatures and heat transfer; air temperature, humidity, and wind distribution in the planetary boundary layer; fundamentals of viscous flows and turbulence; semiempirical theories of turbulence; exchanges of momentum, heat and moisture in the atmospheric surface layer; air modification due to changes in surface properties; agricultural and forest micrometeorology. ARYA, RAMAN

MEA 493C Special Topics in Atmospheric Science. *Preq: Consent of department. 1-3 F,S.* Experiment, individualized study, or research in topics of student's interest which are not covered conveniently in the scheduled courses.

Selected 500-Level Courses Open To Advanced Undergraduates

MEA 512 Satellite Meteorology. *Preq: MA 242; Coreq: MEA 443. 3(3-0) Alt. S.*

MEA 524 Dynamic Meteorology. *Preq: MEA 422 or equivalent. 3(3-0) F.*

MEA 526 Air-Sea Interaction. *Preq: MEA 422 or MEA 560 or CI. 3(3-0) Alt. S.*

MEA 527 Planetary Boundary Layer. *Preq: MEA 455 or MEA 526 or CI. 3(3-0) Alt. F,S.*

MEA 555 Meteorology of the Biosphere. *Preqs: PY 205 or 211; CH 103 or 107; MA 141 or 131. 3(3-0) F.*

MEA 556 Air Pollution Meteorology. *Preqs: MA 241 or 231, PY 208 or 212, CH 103 or 105 or 107 or equivalent. 3(3-0) F.*

MEA 557 Advanced Cloud and Precipitation Physics. *Preq.: MEA 421 or MEA 412. 3(3-0) Alt. F.*

MEA 558 Atmospheric Aerosols. *Preqs.: CH 103 or 107 and PY 205 or 211; Coreq.: MEA 412. 3(3-0) Alt. S.*

MEA 593 Special Topics. *Preq: CI. 1-6 F,S,Sum.*

MILITARY SCIENCE (ARMY ROTC)

(Also see AS—Aerospace Studies.)

MS 101 Introduction to ROTC and the Army. *Enrollment limited to freshman and sophomore students only. 1 (1-1) F,S.* The mission and organization of the U. S. Army and an introduction to ROTC. Advantages, opportunities and benefits of becoming an officer in the Army. Role of the U.S. Army in current events.

MS 106 Map Reading. *Enrollment limited to freshman and sophomore students only. 1 (1-1) S.* Basic map reading techniques: determination of present location through the use of intersection and resection procedures; information for outdoor activities, ranging from competitive orienteering to occasional backpacking.

MS 201 Basic Military Leadership. *Preqs: MS 101 and 106. 2(2-1) F.* Basic instruction and practical work in the fields of leadership and management. Emphasis is on the elemental supervisor, subordinate relationships in a formal organization, drill and physical conditioning. A Saturday trip to the Ft. Bragg Recondo School is offered. Students will be issued uniforms and expected to comply with U.S. army appearance standards.

MS 202 Basic Small Unit Tactics. *Preqs: MS 101 and MS 106. 2(2-1) S.* Principles of small unit (squad level) tactics and their application. Emphasis on basic individual skills and knowledge required to lead squad size organizations. Student leadership laboratory sessions apply tactical principles.

MS 301 Military Leadership and Training Management. *Preq: Advanced course cadets. 3(3-2) F.* Organizational leadership and processes in the Army; leadership activities and key management functions. Management and conduct of group training activities.

MS 302 Intermediate Small Unit Tactics. *Preq: Advanced course cadets. 3(3-2) S.* Planning, organizing and executing military operations at the squad and platoon level. Focus on the leader's actions, map reading and navigation.

MS 401 Military Law and Advanced Tactics. *Preq: MS 301, MS 302. 3(3-2) F.* The role of military justice in the Army and its impact on a soldier's actions in the military, civilian, and international communities are examined. Doctrines and philosophies which dictate the employment of platoon and company size forces, and the role of discipline in developing an effective unit are studied.

MS 402 Military Ethics and Professional Development. *Preqs: MS 301, 302. 3(3-2) S.* Ethics and professionalism of the officer corps. Responsibilities of small unit leaders and techniques for managing people and material. The social aspect of military life.

MUSIC

MUS 100 Instrumental Music. *Student may receive credit for only one section of MUS 100 per semester. Preq: Satisfactorily passing audition. 1(0-4) F,S.* The performance and study of the best in instrumental music. Assignments to various instrumental organizations made according to instrument played and individual interests and abilities.

MUS 101 Beginning Class Piano I. *1(0-1) F,S.* Introductory course for students with no previous piano experience. Music notation, chord formation, keyboard techniques, and ensemble playing. Reading and playing developed through folk, popular, and classical repertoire. LYNCH

MUS 102 Beginning Class Piano II. *Preqs: Mus 101 or equivalent and consent of instructor. 1(0-1) F,S.* A continuation of MUS 101. Further development through the study of more advanced repertoire. LYNCH

MUS 110 Choral Music. *Preq: Satisfactorily passing audition. 1(0-4) F,S.* The performance and study of the best in choral music. Assignments to various choral organizations made according to individual interests and abilities.

MUS 120 Rudiments of Music. *3(3-0) F,S.* Introductory course for students with no musical experience. Learn to read and notate music, as well as sing and play "community song" type melodies on the piano with simple chordal accompaniments. VOGEL

MUS 150 String Chamber Music. *Preqs: Ability to play a stringed instrument (or piano) and consent of instructor. May be repeated for credit once each semester. 1(1-0) F,S.* Analysis, rehearsal, and class performance of string chamber music, with emphasis on the string quartet. Historical development of the string quartet will be the primary research topic. KRAMER

MUS 200 Understanding Music. *3(3-0) F,S.* Understanding our musical heritage. Evaluation of music in terms of its content, form, stylistic period, and the elements of melody, harmony, rhythm, and tone color.

MUS 210 A Survey of Music in America. *3(3-0) S. Alt. yrs.* A historical survey of music in America with emphasis on the major influences which have contributed to the musical literature, investigation of forms and styles and of the roles they have played in the development of various musical traditions. HAMMOND

MUS 215 Music of the 17th and 18th Centuries. *3(3-0) Alt. yrs.* Traces and describes the evolution of European music from 1600 to 1800, with particular emphasis on characteristics of form and style as they apply to music of specific periods. Social, political, and cultural influences are highlighted, representative examples are discussed as well as major composers of each style and period. WARD

MUS 220 Music of 19th Century Europe. *3(3-0) S. Alt. yrs.* A survey of 19th century European music, including analysis of its texts, forms and composers, and its relations to other art forms of the period. STURGIS

MUS 230 Introduction to Music Drama. *3(3-0) F, Alt. yrs.* Surveys of varieties of lyric stage works from opera to musical comedy. Historical references, performance practices and musical analysis are emphasized. Designed for the student who has little or no technical knowledge of music. WARD

MUS 240 Introduction to the Symphony Orchestra and Its Music. *3(3-0) F, Alt. yrs.* Examination of the development of the orchestra as a performing medium and of contemporary symphony orchestras. A survey of orchestra literature of specific forms and types from the 17th century to the present. PETTERS

MUS 250 Vocal Techniques. *1(0-2) F,S.* Instruction in proper vocal techniques and introduction to vocal solo literature. Emphasis on self-improvement through group methods. STURGIS

MUS 260 History of Jazz. *3(3-0) Alt. yrs.* History of jazz and the contributions of major artists. Emphasis of the various styles that have contributed to this American art form. Investigation of structural forms in the jazz idiom. HAMMOND

MUS 300 Chamber Music Performance. *Preq. Satisfactorily passing audition. 1(0-4) S.* Performance of chamber music. Emphasis on chamber literature from the sixteen through the twentieth centuries written for a wide variety of combinations ranging from string quartets to pieces written for specific instruments and voices. VOGEL

MUS 301 Basic Music Theory I. *Preq: Ability to read music. 3(3-0) F,S.* Introductory course for students with no academic musical background. Basic elements of music taught historically through exercises in notation, ear training, written harmony, formal analysis. Application through a study of selected compositions from the musical literature and through the creation of an original composition written by each student. VOGEL

MUS 302 Basic Music Theory II. *Preqs: MUS 301, CI. 3(3-0) F,S.* Second course in music theory. Musical analysis of representative works. Further study of chordal functions and orchestration technics through written exercises. Compositions written by students. VOGEL

MUS 305 Introduction to Music Composition. *Preqs: MUS 301, MUS 302. 3(3-0) F,S.* Designed to provide students with experience in creating original musical compositions. Practice in writing phrases and periods, as well as practice in analysis. Assignments will include various musical forms with emphasis on 18th, 19th, but mostly 20th Century compositional techniques. Characteristics of instruments are explored. Scoring will employ a variety of instrumental and choral groupings. VOGEL

MUS 320 Music of the 20th Century. *3(3-0) F.* A study of representative music from 1900 to the present. Emphasis is upon the composers, their music, and composition technics. Traditional, atonal, serial, aleatory, and electronic music are examined. PETTERS

MUS 495 Special Topics in Music. *1-3 F,S.* New or special subject matter not covered by existing music courses.

NUCLEAR ENGINEERING

NE 201 Introduction to Nuclear Engineering. *Preqs: MA 241, PY 205. 2(2-0) F.* An introduction to the concepts, systems and application of nuclear processes. Topics include radioactivity, fission, fusion, reactor concepts, biological effects of radiation, nuclear propulsion, and radioactive waste disposal. Designed to give students a broad perspective of nuclear engineering and an introduction to fundamentals and applications of nuclear energy.

NE 202 Fundamentals of Nuclear Energy. *Preq: PY 208. 4(3-2) S,Sum.* An introduction to nuclear energy. Topics include radiation detection, interaction of radiation, radioactivity, nuclear reactions, fission, fusion, radiation safety, and nuclear reactors. The laboratory stresses measurement of nuclear radiation.

NE 301 Fundamentals of Nuclear Engineering. *Preqs: MA 301 and a C or better in NE 202. 4(3-2) F.* Topics include neutron physics, reactor theory, and reactor operation. Emphasis on basic principles underlying the design and operation of nuclear systems, facilities and applications. Laboratory sessions include the various techniques of radiation detection and measurement, reactor nuclear instrumentation, and reactor measurements. ELLEMAN, HANKINS

NE 302 Nuclear Reactor Energy Conversion. *Preqs: MAE 301, CSC 111, and a C or better in NE 301. 4(3-2) S.* An introduction to the concepts and principles of heat generation and removal in reactor systems. Topics include power cycles, reactor heat sources, analytic and numerical solutions to conduction problems in reactor fuel elements and single phase convection heat transfer in rod bundles. A laboratory in the basics of heat transfer is included. DOSTER

NE 401 Reactor Analysis and Design. *Preq: C or better in NE 301; Coreq: MA 401. 4(3-2) S.* Elements of nuclear reactor theory and reactor operation, including neutron slowing down and diffusion, Fermi age theory, multigroup concepts, criticality of homogenous and heterogenous reactors, and reactor dynamics. Observation and measurement of reactor behavior and correlation with theory. GILLIGAN, VERGHESE

NE 402 Reactor Engineering. *Preq: NE 302, MA 401. 4(3-2) F.* An introduction to the thermal-hydraulics and to the shielding analysis of nuclear power systems. Topics include

single and two phase flow, boiling heat transfer, modeling of fluid systems; reactor radiation sources, radiation interactions, radiation attenuation, and shielding. Representative design calculations are performed. DOSTER, GILLIGAN

NE 403 Nuclear Engineering Design Projects. *Preq: NE 401, NE 402. 3(2-3) S.* Student projects in design of practical nuclear engineering systems. Preliminary designs are developed by teams with advice by faculty as needed, and reports are presented in oral and written form. Current and future systems are emphasized, and use of computers is encouraged.

NE 404 Radiological, Reactor, and Environmental Safety. *Preq: NE 302 or 419. 3(3-0) F.* A basic course in health physics and the environmental aspects of nuclear power generation. Topics include: biological effects of radiation, dose-rate evaluation, radiation monitoring, and radiological safety; reactor effluents and radioactive waste disposal; regulations governing radiation exposure and the release of radioactivity into the environment; environmental impact of nuclear power plants. MANI

NE 405 Reactor Systems. *Preq: NE 401; Coreq: NE 402. 3(3-0) F.* Nuclear power plant systems: design criteria, design parameters, and economics. Topics covered include: PWR, BWR, core design, primary loops, auxiliary and emergency systems; containment, reactor control and protection systems, accident and transient behaviors. TURINSKY

NE (MAT) 409 Nuclear Materials. *Preq: MAT 201. 2(2-0) S.* Materials used in nuclear reactors-pertinent factors in selection and utilization of the materials, and the effects of radiation on their physical, chemical and mechanical properties. MURTY

NE 412 Nuclear Fuel Cycles. *Preq: NE 401. 3(3-0) S.* Processing of nuclear fuel with description of mining, milling, conversion, enrichment, fabrication, irradation, shipping, reprocessing, and waste disposal. Fuel cycle economics and fuel cost calculation. In-core and out-of-core nuclear fuel management, engineering concepts, and methodology. TURINSKY, VERGHESE

NE 414 Nuclear Power Plant Instrumentation. *Preqs: NE students: ECE 331, 332; EE students: NE 419. 3(3-0) F.* Instrumentation required for control and safety of a nuclear power plant. The dynamic behavior of a nuclear plant developed so that the characteristics required of the instrumentation may be stated. Methods of combining the various measured parameters, (e.g. neutron flux, coolant flow, coolant pressure, temperature) to achieve safe operation. Protection against loss-of-power, lightning, and other common-mode failures.

NE 419 Introduction to Nuclear Engineering. *Preqs: PY 202 or PY 208; Not open to majors in Nuclear Engineering. 3(3-0) F,S.* Electrical power generation from nuclear fission, fundamental aspects of fission chain reaction, and reactor design. Reactor types, their static and dynamic characteristics and instrumentation. Reactor operation and safety. Nuclear fusion and fusion reactor development. ELLEMAN, VERGHESE

NE 491 Special Topics in Nuclear Engineering. *Preq: CI. Variable credit. 1-4. Detailed coverage of special topics.*

Selected 500-Level Courses Open To Advanced Undergraduates

NE 508 Radiation Safety. *Preq: NE 401 or NE 520. 3(2-3) S.*

NE (PY) 511 Nuclear Physics for Engineers. *Preq.: PY410 3(3-0) F.*

NE 520 Radiation and Reactor Fundamentals. *Preqs: MA 401 and NE 401 or equivalent. 2(2-0) F.*

NE 521 Nuclear Laboratory Fundamentals. *Preqs: MA 401 and NE 401 or equivalent. 2(1-3) F.*

NE 522 Reactor Dynamics and Control. *Preq: NE 401 or NE 520. 3(3-0) F.*

NE 523 Reactor Analysis. *Preqs: NE 401 or NE 520. 3(3-0) F.*

NE 524 Reactor Heat Transfer. *Preq: NE 402 and NE 401 or NE 520, 3(3-0) S.*

NE (MAT) 525 Nuclear Materials. *Preqs: NE 409 or MAT 201, CI. 3(3-0) F.*

NE 526 Radioisotopes Measurement Applications. *Preq: NE 401 or 520. 3(3-0) S.*

NE 527 Nuclear Engineering Analysis. *Preqs: NE 401 or NE 520. 3(3-0) F.*

NE 528 Principles of Fusion Reactors. *Preq: NE 401 or NE 520. 3(3-0) S.*

NE 580 Plasma Generation and Diagnostics Laboratory. *Preq: NE 528 or PY 508 or PY 509. 3(2-3) F. Alt. yrs.*

NE 581 Fusion Energy Engineering. *Preq: NE 528. (3-0) F. Alt. yrs.*

tanding. 3(3-0) F.

NE 591, 592 Special Topics in Nuclear Engineering I, II. *Preq: CI. 3(3-0) F,S.*

NAVAL SCIENCE (NAVY ROTC)

NS 100 Midshipman 4/C Naval Science Laboratory. *0(0-1) F,S.* Military drill, courtesies and honors, elements of unit leadership, physical fitness and professional development of the prospective Naval/Marine Corps Officer. Required of Midshipmen 4/C.

NS 110 An Introduction to Naval Science. *2(2-0) F.* Fundamental orientation to the Naval Service emphasizing the mission, organization, regulations, customs and traditions, broad warfare components of Navy and the major challenges facing today's Navy and Marine Officers.

NS 120 Naval Ships Engineering Systems. *3(3-0).* Introduction to the types, structure and purpose of naval ships. Survey of naval engineering systems with emphasis on marine propulsion and control systems, supporting auxiliary subsystems, ship design and stability and damage control procedures.

NS 200 Midshipman 3/C Naval Science Laboratory. *0(0-1) F,S.* Continuation of NS 100. Required of Midshipmen 3/C.

NS 220 Naval Weapons Systems. *3(3-0).* Theory and principles of operation of naval weapons systems emphasizing types of weapons and fire control systems, capabilities and limitations, theory of target acquisition, identification and tracking, trajectory principles, and basics of naval ordinance.

NS 300 Midshipman 2/C Naval Science Laboratory. *Preq: Junior standing. 0(0-1) F,S.* Continuation of NS 200. Required of Midshipmen 2/C.

NS 310 Navigation. *4(3-2) F.* A comprehensive study of the theory, principles and procedures of ship navigation, movements and employment. Course includes mathematical analysis, spherical triangulations and practical work involving sight reduction, sextant, publications and report logs.

NS 320 Naval Operations. *Preq: Junior standing. 4(3-2) S.* Components of general naval operations, including concepts and application of tactical formations and dispositions, relative motion, maneuvering board and tactical plots, rules of the road and naval communications.

NS 330 Evolution of Warfare. *Preq: Junior Standing. 3(3-0).* A survey of the evolution of warfare through the study of selected campaigns and classic battles with special emphasis on the principles of war, the military impact of leadership, and the evolution of tactics, weapons, and weaponry.

NS 400 Midshipman 1/C Naval Science Laboratory. *Preq: Senior standing. 0(0-1) F,S.* Continuation of NS 300. Required of Midshipmen 1/C.

NS 410 Naval Leadership and Management I. *Preq: Junior standing. 1(1-0) F.* Organizational principles, management theory and leadership styles as they apply in the Navy and Department of Military Defense.

NS 420 Naval Leadership and Management II. *Preq: Senior standing. 1(1-0) S.* Skills and abilities needed for competence as a commissioned officer in the area of human

resources management, naval personnel management, material management, and the administration of discipline.

NS 430 Amphibious Warfare. *Preq: Senior standing. 3(3-0) S. Alt yrs.* A survey of the projection of sea power ashore with special emphasis on the evolution of and innovation in amphibious warfare in the 20th Century through the study of historical amphibious landings and campaigns.

NUTRITION

NTR (ANS, FS) 301 Modern Nutrition. *Preq: Sophomore standing. Food science majors may use as a free elective only. 3(3-0) F,S.* Introduction to principles of nutrition; properties and functions of essential nutrients: carbohydrates, proteins, fats, vitamins, minerals, water. Food providing required nutrients; selection of adequate diet; nutrition through life cycle; nutritional deficiencies. Obesity, arterial and heart disease; weight control; vegetarian diets; "organically-grown" foods; megavitamin controversy; fad diets and food quackery; food additives; world food crisis. ASH

NTR (ANS, PO) 415 Comparative Nutrition. *Preq: CH 220 or both 221 and 223. 3(3-0) F.* (See Animal Science or Poultry Science.)

NTR (ANS) 419 Human Nutrition in Health and Disease. *Preqs: BCH 451, NTR 415 or FS 400. 3(3-0) F.* Current concepts and physiological bases of the roles of nutrition in the maintenance of health during the different stages in the life cycle and in the prevention and therapy of specific disease states in humans. ASH

NTR 490 Nutrition Seminar. *Preq: Sr. standing. 1(1-0) S.* Reviews, analyses and discussions of selected problems of current interest in the field of human nutrition and allied sciences. Each student will be required to make at least two oral presentations on subjects of their choosing. Classes will consist of student presentations and outside speakers.

NTR 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

NTR 493 Special Problems in Nutrition. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

NTR 495 Special Topics in Nutrition. *1-3 F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

Selected 500-Level Courses Open To Advanced Undergraduates

NTR (ANS) 516 Animal Nutrition Research Methods. *Preq: BCH 451 or NTR (ANS) 415 or NTR (ANS) 419 or FS 400. 1-4(0-8) S.*

NTR (ANS) 540 Ruminant Physiology and Metabolism. *Preqs.: BCH 451 or 551, ZO 421. 3(3-0) F. Even yrs.*

NTR 590 Topical Problems in Nutrition. *Preq: Grad. or sr. standing. 1-6 F,S.*

OPERATIONS RESEARCH

Selected 500-Level Courses Open To Advanced Undergraduates

OR 501 Introduction to Operations Research. *Preqs: MA 421 or ST 421 or ST 371 and ST 372. 3(3-0) F,S.*

OR (IE, MA) 505 Linear Programming. *Preq: MA 405. 3(3-0) F,S.*

OR 506 Algorithmic Methods in Nonlinear Programming. *Preqs: MA 301, MA 405, knowledge of computer language, such a FORTRAN or PL1. 3(3-0) F.*

OR (IE) 509 Dynamic Programming. *Preqs: MA 405, ST 421. 3(3-0) S.*

OR (CHE) 527 Optimization of Engineering Processes. *Preqs: CHE 451 or OR 501, FORTRAN programming. 3(3-0) F.*

OR (E, MA) 531 Dynamical Systems and Multivariable Control. *Preqs: MA 301, 405 or equivalent. 3(3-0) F.*

OR (IE) 561 Queues and Stochastic Service Systems. *Preq: MA 421. 3(3-0) F.*

OR (CSC, CSE, ECE, IE) 562 Computer Simulation Techniques. *Preq: ST 516 and a scientific programming language. 3(3-0) F.*

OR (CSC, MA) 585 Graph Theory. *Preq: MA 231 or 405. 3(3-0) F.*

OR 591 Special Topics in Operations Research. *Preq: CI. 1-3 F,S,Sum.*

PUBLIC ADMINISTRATION

(Also see also PS—Political Science.)

Selected 500-Level Courses Open To Advanced Undergraduates

PA 511 Public Administration. *Preqs: Advanced undergrad. standing including 12 hours of political science, grad. standing or PBS status. 3(3-0) F,S,Sum.*

PA 516 Public Policy Analysis. *Preq: Advanced undergrad. standing including 12 hours of political science, grad. standing or PBS status. 3(3-0) F,S,Sum.*

PA 518 Organization Design. *Preq.: Advanced undergrad. standing including 12 hours of political science, grad. standing or PBS status. 3(3-0) S.*

PA 520 Environmental Policy. *Preq: Advanced undergrad. standing including 12 hours of political science, grad. standing or PBS status. 3(3-0). F.*

PA 571 Research Methods and Analysis. *Preqs: Advanced undergrad. standing including 12 hours of political science, grad. standing or PBS status and an introductory course in statistics. 4(3-1) F,S.*

PA 574 Data Management in Public Administration. *Preqs: PS 374 or PA 573 and previous coursework or experience in public administration. 3(3-0) S.*

PA 598 Special Topics in Public Administration. *Preq: Advanced undergrad. standing including 12 hours in political science, grad. standing or PBS status. 1-6 F,S,Sum.*

PRODUCT DESIGN

(Also see DN—Design; VD—Visual Design.)

PD (TAM) 170 Textile Design Orientation. *1(0-2) S.* Orientation course designed to present the breadth and scope of the Textile Design profession, together with future opportunities in this field.

PD 255 Contemporary Manufacturing Processes I. *3(3-0) F.* Introduction to mass production processes and their influence on design. Wood, paper and metal manufacturing processes utilized in quantity production. Emphasis on materials comparison and process selection in relation to product function, form, human factors and productibility. Field trips required.

PD 256 Contemporary Manufacturing Processes II. *3(3-0) S.* Second course in mass production processes and their influences on design. Emphasis on material search and process selection in relation to form, function, human factors, finishes, and joining methods. Plastics and rubber and their specific manufacturing processes utilized in mass production.

PD 262 Professional Practice in Product Design. *3(3-0) F.* Issues and situations encountered in a design practice. Topics include portfolio and resume preparation, patents, contracts, basic marketing skills within corporations and in freelance design.

PD 318 Ideation I. *3(2-2) F.* The ideation process of conceiving, developing and recording ideas two-dimensionally. These techniques defined and practiced as an extension of understanding the human ideamotor process.

PD (TAM) 371 Woven Textile Design. *Preqs: PD T 105. 3(1-4) F.* Design and production of woven fabrics, including an exploration of various basic structures, color effects and textural effects. Development of design abilities through hand production methods with an awareness of industrial processes. DONALDSON

PD (TAM) 372 Knitted Textile Design. *Preq: T 105. 3(1-4) S.* Design and production of both hand and machine-knitted fabrics, jacquard patterning, and color effects. Development of design abilities through practical application of hand- and machine-production methods. Awareness of industrial processes. DONALDSON, WILCHINS

PD 400 Product Design Studio. *Preqs: DF 102; written approval of Department Head and Dean. 6(0-9) F,S,Sum.* A progression of studio experiences that expand upon and combine the intellectual and manual skills required for the practice of Industrial Design. Emphasis on identifying and solving design problems through manipulation of form, application of human factors, product safety awareness, appropriate combination of materials and fabrication techniques, and the presentation of concepts.

PD 415 Microcomputer Imaging in the Design Process. *Preq: School of Design students only. 3(3-0) F,S.* The computer as a design tool for simulating two- and three-dimensional images; experimentation with graphics generation; exposure to computer generated video images. No computer experience is necessary.

PD 418 Ideation II. *3(2-2) S.* This is an advanced course which expands the ideation process with greater emphasis directed toward the creative development and recording of conceptual design phase.

PD (TAM) 470 Textile Design Studio. *Preqs: A grade of C or better in PD (TMT) 272, 371, and 372. 6(0-9) F.* Semester design project based on a single problem statement. Individual investigation of resources, processes and solutions in the development of a collection of fabrics or end products. Public exhibition of collections. WILCHINS

PD 494 Internship in Product Design. *Preqs: Junior standing in Product Design; 3.0 GPA or better; and written approval of Department Head. Maximum 6 credit hours. 3-6 F,S.* Supervised field experience in product design offices and organizations.

PD 495 Independent Study in Product Design. *Preqs: Junior standing in Product Design; 3.0 GPA or better; and approval of Department Head. Maximum 6 credit hours. 1-3 F,S.* Special projects in product design developed under the direction of a faculty member on a tutorial basis.

Selected 500-Level Courses Open To Advanced Undergraduates

PD 511 Product Design Materials & Processes I. *Preq: Grad standing: waiver of prerequisite is at the discretion of the instructor. 3(3-0) F.*

PD 512 Product Design Materials & Processes II. *Preq: Grad standing; waiver of prerequisite is at the discretion of the instructor. 3(3-0) S.*

PHYSICAL EDUCATION

PE 100 Health and Physical Fitness. *1(0-2) F,S,Sum.* Benefits of a physical fitness training program; training principles, training guidelines, fitness components and misconceptions, nutrition, weight control, stress management, and contemporary health issues.

ACTIVITY COURSES.

The following activity courses may be used to fulfill the University physical education requirements. Elective theory courses that do not constitute credit toward meeting physical education requirements are listed below following PE 275.

PE 112 Beginning Swimming. *1(0-2) F,S,Sum.* Swimming skills for the non-swimmer that are essential for survival in the water.

PE 113 Advanced Beginning Swimming. *Preq: PE 112 or equivalent skills. 1(0-2) F,S,Sum.* Continuation of Beginning Swimming: development of basic strokes, learning new strokes and survival skills.

PE 116 Soccer. *1(0-2) F,S,Sum.* Soccer with emphasis on skills development, playing strategies, and rules of the game.

PE 117 Gymnastics. *1(0-2) F,S.* Fundamentals of gymnastics for men and women. Floor exercise, vaulting, parallel and uneven bars, horse, pommel, and spotting.

PE 118 Restricted Activity I. *Preq: Documentation of medical restriction. 1(0-2) F.* For students who have physical and medical problems and cannot take the regular physical education classes. A course of study is designed in which individual needs and limitations are accommodated.

PE 119 Restricted Activity II. *Preq: Documentation of medical restriction. 1(0-2) F.* Follows PE 118 for students who require adapted physical activities due to medical and physical limitations.

PE 220 Water Aerobics. *Preq: PE 112. Individual under medical care must have prior approval from physician before registering for the course. 1(0-2) F,S, Sum.* An individually paced water exercise program designed to increase cardiovascular endurance, muscular strength, muscular endurance and flexibility. Conducted in waist to chest deep water.

PE 221 Intermediate Swimming. *Preq: PE 113 or equivalent skill. 1(0-2) F,S,Sum.* Techniques for the front crawl, back crawl, elementary backstroke, breaststroke, and sidestroke, cardiovascular fitness and endurance, water safety techniques.

PE 222 Water Polo. *PE 221 or equivalent skills. 1(0-2) F,S.* Fundamental skills of water polo.

PE 223 Lifeguard Training. *Preq: PE 221 or equivalent. 1(0-2) F,S.* Advanced techniques of Lifeguard Training with American Red Cross certification upon completion of course requirements. Optional fee assessed for certification.

PE 224 Water Safety Instructors. *Preq: Current certification in Lifeguard Training or Emergency Water Safety. 1(0-2) F,S.* Designed to qualify students for a Red Cross Water Safety Instructor's rating. Optional fee assessed for certification.

PE 226 Skin and Scuba Diving I. *Preq: PE 221 or equivalent skills. 2(0-2) F,S,Sum.* Basic theory and skills related to skin and scuba diving. Emphasis on equipment, diving maladies, safety and physical conditioning for diving. Additional fee assessed for the open water experience and certification.

PE 227 Scuba Diving II. *Preq: PE 226 or basic scuba diving certification. 2(0-2) F,S.* Scuba skills development, first aid, CPR and openwater rescues.

PE 228 Springboard Diving. *Preq: PE 113 or equivalent skills. 1(0-2) F,S,Sum.* Individual development of the basic skills of one meter and three meter springboard diving.

PE 229 Swim Conditioning. *Preq: PE 113 or equivalent skills. 1(0-2) F,S,Sum.* Improvement of cardiovascular fitness through various aquatic training techniques.

PE 231 Body Conditioning and Aerobics. *1(0-2) F,S,Sum.* Instruction in exercise prescription, safety precautions during exercise and proper exercise technique.

PE 233 Clogging. *1(0-2) F,S.* Study of traditional and precision clog dancing with emphasis on fundamental skills, combinations and clogging routines.

PE 234 Country and Square Dance. *1(0-2) F,S.* Mountain Square Dance, Western Square Dance, and American Country Dances.

PE 235 Karate. *1(0-2) F,S.* An introduction to traditional (Shotokan) Karate, providing instruction in basic techniques (kihon) of attacking, blocking, and counterattacking, sparring (Kumite), and formal drills (kata).

PE 236 Track and Field. *1(0-2) F,S.* Develops knowledge and appreciation of, and skill in track and field events.

PE 237 Weight Training. *1(0-2) F,S,Sum.* Provides essential knowledge of the principles of muscular strength development and an opportunity to acquire skill in a variety of progressive resistance exercises.

PE 238 Wrestling. *1(0-2) F,S.* Wrestling skills, safety considerations, and conditioning factors necessary for moderate competition in a combative sport—beginning skills through more advanced techniques.

PE 239 Triathlon Swim-Bike-Run. *Preq: PE 221 or equivalent skill and PE 100. 1(0-2) F,S.* Techniques and training that maximize fitness gains and minimize injuries. Bicycles and ANSI approved helmets need to be provided by the students.

PE 240 Social Dance. *1(0-2) F,S.* Basic steps and fundamentals of leading and following in the Foxtrot, Waltz, Cha-Cha, Shag and Rumba.

PE 241 Angling. *1(0-2) F,S.* Introduction to a variety of casting systems (spinning, bait-casting, fly-casting) and an understanding of inland fishing relating to North Carolina waters. Includes tackle and bait selection, N.C. laws and regulations, species identification and opportunities for field trips. Fee assessed for North Carolina fishing license.

PE 242 Badminton. *1(0-2) F,S,Sum.* Skills development, strategies and rules of singles and doubles play.

PE 243 Bowling. *1(0-2) F,S,Sum.* Instruction in ball selection, grip, stance, approach, delivery, bowling etiquette, safety precautions, rules, scoring, terminology, and general theory of spare coverage. Additional fee assessed.

PE 244 Fencing. *1(0-2) F,S.* Development of offensive and defensive skills; emphasis on rules, courtesy, and strategy of bouting.

PE 245 Golf. *1(0-2) F,S,Sum.* Fundamentals of golf: grip, stance, swing skills. Use of various clubs. Rules and etiquette of play.

PE 246 Handball. *1(0-2) F,S.* Skills development, rules and strategies for singles and doubles play.

PE 247 Roller Skating. *1(0-2) F,S.* Fundamental and intermediate skills of skating: starting, turning, stopping. Emphasis on balance and coordination with speed work.

PE 248 Squash. *1(0-2) F,S.* Skill development and strategies of play. Equipment selection, safety, history, and rules.

PE 249 Tennis I. *1(0-2) F,S,Sum.* Basic tennis skills of grips, footwork, groundstrokes, service. Rules and basic strategy for singles play. Introduction to volleys, lobs, overheads, and doubles.

PE 250 Tennis II. *Preq: PE 249 or equivalent skills. 1(0-2) F,S.* Review of tennis skills and refinement of grips, footwork, groundstrokes, service, rules and basic strategies of singles and doubles. Emphasis on volleys, lobs, overheads, supplemental shots, active drills, and playing situations.

PE 251 Target Archery. *1(0-2) F,S,Sum.* Shooting fundamentals. Safety, selection and care of equipment.

PE 252 Downhill Skiing. *1(0-2) S.* Fundamentals, safety, equipment selection and care, straight runs, turns, and slalom. Offered in January (semester break) at a ski site selected by the Department, with organizational meeting and 3 class meetings on campus prior to the trip. University pre-registration unnecessary. Additional fee assessed.

PE 253 Orienteering. *1(0-2) F,S.* Navigating on foot defined point to defined point, with use of map and compass in the shortest possible time.

PE 254 Beginning Equitation. *1(0-2) F,S.* Hunt seat equitation, care of horse and tack, and control skills at the walk, trot and canter. Meets off campus once a week. Additional fee assessed.

PE 255 Canoe Tripping. *Preq: PE 112 or equivalent skills. 1(0-2) F,S.* Instruction and experience in flat water canoe tripping skills emphasizing paddling skills, river travel techniques, safety, minimal impact camping techniques and proper equipment selection. Plan and participate in two required weekend field trips. Additional fee assessed.

PE 256 Racquetball. *1(0-2) F,S,Sum.* Skills development, strategies and rules of singles and doubles play.

PE 257 Backpacking. *1(0-2) F,S.* Designed for students with little or no backpacking experience. Safe and environmentally-sound camping practices. Equipment/clothing, first aid and safety management agencies, land navigation, and trip planning. Two weekend field trips required. Additional fee assessed.

PE 258 Basic Rockclimbing. *1(0-2) F,S.Sum.* Instruction and direct experience for the beginning rock climber. Emphasis is on safe rope systems for belaying and basic movement on rock.

PE 259 Intermediate Rock Climbing. *Preq: PE 258 or equivalent skills. 1(0-2) F,S.* Development of intermediate rock climbing skills, including partner and self rescue, lead climbing, training systems and field trip opportunities. Additional fee assessed.

PE 261 Basketball. *1(0-2) F,S.* Skill development. Offensive and defensive systems of team play. History and rules of the sport.

PE 263 Tap Dance. *1(0-2) F,S.* Fundamentals of tap dance. Emphasis on basic rhythmic exercises, traveling steps, and tap routines.

PE 264 Ballet. *1(0-2) F,S.* Fundamentals of ballet. Emphasis on barre technique, exercises, steps Au Milieu (center work without barre), and steps Allegro.

PE 265 Softball. *1(0-2) F,S,Sum.* Basic skills, rules, and strategies for playing softball.

PE 266 Ultimate Frisbee. *1(0-2) F,S.* Emphasis on skill development and competition. Includes flight dynamics, throwing, catching, offensive skills, defensive skills, equipment, and rules of the game.

PE 267 Flag Football. *1(0-2) F,S.* An introduction to the skills, history, rules and strategy of flag football.

PE 269 Volleyball I. *1(0-2) F,S,Sum.* Volleyball fundamentals: setting, passing, serving, spiking, court movement, and game strategy.

PE 270 Volleyball II. *Preq: PE 269 or equivalent. 1(0-2) F,S.* Advanced techniques, theories and strategies of volleyball.

PE 271 Varsity Sports. *Preq: 1 hr. of P.E. credit. 1 F,S.* For students participating in a varsity sport during that sport's scheduled season.

PE 272 Dance Composition. *Preq: PE 274 or PE 264. 1(0-2) F,S.* Creative problem-solving using the components of movement composition. Development of movement vocabulary through structured improvisation. Development of a thematic phrase. Manipulation of the thematic phrase through various choreographic devices. Structure of the developed materials.

PE 273 Jazz Dance. *1(0-2) F,S.* Modern jazz styles through instruction in beginning jazz skills and combinations. Reduction of inhibition and development of creativity and free movement.

PE 274 Modern Dance I. *1(0-2) F,S.* Fundamental techniques of movement and dance, theory and history of modern dance as an art form, improvisation and composition, structured dance exercises, and dance combinations.

PE 275 Modern Dance II. *Preq: PE 274 (or permission of instructor). 1(0-2) F,S.* Continuation of Modern Dance I. Clarification of design of body in space, dance movement qualities and phrasing, performance of phrases of repertory materials.

ELECTIVE THEORY COURSES.

The following courses do not constitute credit toward meeting the University physical education requirements.

PE 201 Coaching Baseball/Softball. *2(2-0) S.* Theories, techniques, and strategies of coaching baseball/softball.

PE 202 Coaching Basketball. *2(2-0) F.* Theories, techniques, and strategies of coaching basketball.

PE 203 Coaching Football. *2(2-0) F.* Theories, techniques, and strategies of coaching football.

PE 204 Coaching Golf. *2(2-0) S.* Theories, techniques, and strategies of coaching golf.

PE 205 Coaching Soccer. *2(2-0) F.* Theories, techniques, and strategies of coaching soccer.

PE 206 Coaching Swimming and Diving. *2(2-0) S.* Theories, techniques and strategies of coaching swimming and diving.

PE 207 Coaching Tennis. *2(2-0) S.* Theories, techniques, and strategies of coaching tennis.

PE 208 Coaching Track & Field/Cross-Country. *2(2-0) S.* Theories, techniques, and strategies of coaching track and field and cross-country.

PE 209 Coaching Volleyball. *2(2-0) F.* Theories, techniques, and strategies of coaching volleyball.

PE 210 Coaching Wrestling. *2(2-0) S.* Theories, techniques, and strategies of coaching Wrestling.

PE 277 Coaching Concepts. *3(3-0) F.* Theoretical and practical concepts involved in coaching preparation. Practical knowledge necessary in applying these concepts.

PE 278 Principles of Sports Science. *3(3-0) F.* Basic principles of human anatomy, physiology, and biomechanics and their relationship to athletic coaching.

PE 279 Introduction to Sport Management. *2(2-0) S.* Philosophies, theories, and techniques for planning, organizing, and managing scholastic sport programs.

PE 281 Introduction to Athletic Training. *Preq: PE 280. 3(2-3) S.* Examines the incidence, causes, prevention and treatment of sports-related injuries. Topics stressed are conditioning for sports, injury recognition and evaluation, taping techniques, first-aid care, treatment, and reconditioning of athletic injuries.

PE 290 Athletic Officiating: Football and Wrestling. *2(2-0) F.* Rules and mechanics of officiating football and wrestling. Out-of-class officiating required.

PE 291 Athletic Officiating: Volleyball and Basketball. *2(2-0) F.* Rules and mechanics of officiating volleyball and basketball. Out-of-class officiating required.

PE 292 Athletic Officiating: Soccer and Baseball. *2(2-0) S.* Rules and mechanics of officiating soccer and baseball/softball. Out-of-class officiating required.

PE 301 Coaching Practicum. *Preq: 15 hours of PE. 1(0-4) F,S.* A seven-week practical coaching experience in a junior high school or high school setting. Specific placement will depend upon the various playing seasons for the sports involved.

HEALTH STUDIES COURSES

The following courses do not constitute credit toward meeting the University physical education requirements.

PEH (PE, MDS, UNI) 211 Alcohol Use and Abuse. *3(3-0) S.* The history of human involvement with alcohol is reviewed. Physiological, cultural, sociological, and psychological aspects of drinking alcohol are explored. Responsible use patterns; chronic abuse; current educational, prevention, and rehabilitation areas are explored. Students will have the option to develop peer helper skills during the course.

PEH (PE, MDS, UNI) 212 Drug Abuse and Human Behavior. *3(3-0) F,S.* Review of substance use and abuse. Discussion of pharmacological, physical, psychological and socioeconomic components of addiction and its treatment. Trends in attitudes and intervention/prevention programs will be explored.

PEH (PE) 280 Emergency Medical Care and First Aid. *2(2-0). F,S,Sum.* Each student who satisfactorily completes the course requirements will receive the American Red Cross Standard First Aid and Personal Safety Certificate. Those students who rate superior in the areas of respiratory and cardiac emergencies will have the opportunity to complete the requirements for the American Red Cross Basic Life Support Certificate. Optional fee assessed for certification.

PEH (PE) 285 Personal Health. *2(2-0) F,S.* A lecture-discussion course with emphasis on personal health including mental health, alcoholism, drugs, sexuality, nutrition, family health, diseases, health quackery and health practitioners.

PEH (PE) 286 Nutrition, Exercise and Weight Control. *2(1-2) F,S.* A weight control program that emphasizes knowledge of nutrition, controlled eating habits and exercise. Individual weight loss prescribed.

PEH (PE, MDS, UNI) 334 Human Sexuality. *3(3-0) F,S,Sum.* Historic and cultural background of human sexuality. Physiological and psychological aspects of sexual response and reproduction. Development of sexual values. Birth control; sexually transmitted disease; gender acquisition, legal and moral issues. Appraisal of place and significance of sexuality in contemporary American culture.

PHILOSOPHY

(Also see REL—Religion.)

PHI 201 Logic. *3(3-0) F,S,Sum.* Introduction to the methods of deductive inference. Concepts of validity and implication defined and applied to statements and arguments.

PHI 205 Problems and Types of Philosophy. *3(3-0) F,S,Sum.* In this introductory course the matters discussed will always be those with a history of importance in philosophy, such as problems concerning God, freedom, justice, and the nature and objects of human knowledge.

PHI 250 Practical Reasoning. *3(3-0) F,Sum.* Analysis and criticism of both deductive and inductive argument. Deduction validity and soundness in deductive arguments; definition and the clarification of meaning; disproof by counter-example; common fallacies. Inductive arguments: polls and samples; correlations and causal connection. Conceptual and empirical theories and hypotheses. Arguments discussed with a minimum of formalization.

PHI 275 Ethics. *3(3-0) F.* An examination of the traditional questions of philosophical ethics: What sort of life is worthy of a human being, and what are the principles of moral conduct? Both classic and contemporary literature will be studied.

PHI 298 Special Topics in Philosophy. *3(3-0).* Selected studies in philosophy that do not appear regularly in the curriculum. Topics will be announced for each semester in which the course is offered.

PHI 300 Early Western Philosophy. *3(3-0) F.* The philosophical movements of Western Civilization from the pre-Socratics of ancient Greece to the scientific revolution of the 17th century, with particular emphasis on Plato and Aristotle.

PHI 301 Modern Western Philosophy. *3(3-0) S,Sum.* A critical survey of selected works of major Western philosophers of the 17th and 18th centuries: Descartes, Spinoza, Leibniz, Locke, Berkeley, Hume, and Kant.

PHI 304 Philosophy of Education. *3(3-0) S. Alt. yrs.* Fundamental philosophical questions and concepts concerning education: What is the nature of education? What are its purposes? How are its nature and purposes related to the nature of knowledge? How are models of teaching justified.

PHI 305 Philosophy of Religion. *3(3-0) F,Sum.* The existence and nature of God, including such topics as traditional proofs of God, skeptical challenges to religious belief, miracles, the problem of evil, faith and reason, and religious experience. HAMBOURGER

PHI 306 Philosophy of Art. *3(3-0) S,Sum.* An analysis of the concepts and theories encountered in discussion of art in such a way as to illuminate the nature of works of art, esthetic experiences, and art criticism. MARTIN

PHI 309 Contemporary Political Philosophy. *3(3-0) S.* Current theories about basic concepts in political philosophy, such as liberty, equality, justice, natural rights, and democracy, with special attention to disputes concerning the nature of a just social order. REATH, VANDEVEER

PHI 311 Philosophical Issues in Medical Ethics. *3(3-0) F.* Such issues as the morality of abortion, suicide, and euthanasia; the meaning and function of the concepts of health, illness, and death; psychological intervention; paternalism in medicine; consent and medical experimentation; and the allocation of scarce medical resources. Consideration of individual rights and fairness. Emphasis is on conceptual clarity and the assessment of moral principles. VANDEVEER

PHI 312 Philosophy of Law. *3(3-0) F.* Fundamental issues concerning law such as what makes something a law or legal system and when legal interference with individual liberty is justified. Each philosophical issue tied to particular legal cases. LEVENBOOK

PHI 313 Ethical Problems in the Law. *3(3-0) S.* Explores the way participants in the legal system should act and to what uses the legal system should be put focusing on specific questions, for example: What, if any, is the moral basis for punishment, plea bargaining, civil disobedience, involuntary mental commitment, consensual sex crimes, fault in the criminal law? LEVENBOOK

PHI 314 Issues in Business Ethics. *3(3-0).* An analysis and evaluation of major issues in business ethics. Topics include the social responsibility of business; social justice and free enterprise; the rights and duties of employers, employees, manufacturers and consumers; duties to the environment, the world's poor, future generations, and the victims of past injustices; the moral status of the corporation; and the ethics of advertising. PIERCE

PHI 321 Contemporary Moral Issues. *3(3-0) F,S,Sum.* Philosophical analysis and theory applied to a broad range of contemporary moral issues, including euthanasia, suicide, capital punishment, abortion, war, famine relief, environmental concerns.

PHI 322 Philosophical Issues in Environmental Ethics. *3(3-0) S.* An exploration of the nature and possibility of an environmental ethic. The course investigates the extent to which so-called "primitive" views of nature may contribute to such an ethic and examines the moral issues posed by land use planning, energy production and consumption, endangered species, food production policies, and obligations to future generations. REGAN

PHI 323 Nuclear Arms: Philosophical Issues. *3(3-0).* Alternative theories of rational decision making and morality considered in the context of the nuclear arms race. CARTER

PHI 325 Theories of Human Nature. *3(3-0) S.* Philosophical and scientific theories of human nature, with special attention to "nature/nurture" controversies. Detailed treat-

ment of one of two contemporary issues, such as IQ, sociobiology, gender differences, or abortion, in which the question "what is a human being?" plays a central role.
ANTONY, AUERBACH

PHI 330 Metaphysics. *3(3-0) S.* An examination of metaphysical problems and questions, most of which have classical origins. These will usually be treated from a contemporary perspective. Typical problems are those connected with appearance and reality, free-will and determinism, mind and body, and space and time. CARTER

PHI 331 Philosophy of Language. *3(3-0) S.* Introduction to traditional and modern accounts of the relations between language and reality. The nature of truth and linguistic meaning, the unique character of human knowledge of natural language, and problems of intentionality. AUERBACH

PHI 332 Philosophy of Psychology. *3(3-0) S.* Problems and controversies that overlap the boundary between philosophy and psychology: the mind/body problem, behaviorism vs. cognitivism, the prospects for artificial intelligence, and language and the question of innate knowledge. ANTONY, LEVINE

PHI 333 Theory of Knowledge. *3(3-0) F.* Analysis of such central concepts as knowledge, belief, and truth, and the investigation of the principles by which claims to knowledge may be justified. CARTER

PHI 335 Symbolic Logic. *3(3-0) F,S.* Introduction to modern symbolic logic. Examination of the procedures for translating certain sentences into logical notation and for manipulating that notation to produce correct inferences. Also introduction to mathematical study of logic; properties of the symbolic system itself. AUERBACH, LEVIN

PHI 340 Philosophy of Science. *3(3-0) F,S.* Character and function of explanation in scientific activity, concepts of law and theory, role of inductive confirmation, and relationship between natural and social sciences. AUSTIN

PHI (PSY) 425 Introduction to Cognitive Science. *Preq: One upper-level course in either PHI, PSY, CSC or Linguistics. Credit cannot be given for both PHI/PSY 425 and PHI/PSY 525. 3(3-0) F.* Philosophical foundations and empirical fundamentals of cognitive science, an interdisciplinary approach to human cognition. Topics include: the computational model of mind, mental representation, cognitive architecture, the acquisition and use of language. ANTONY, LEVINE

PHI 498 Special Topics in Philosophy. *Preq: Six credits in PHI. 1-6 F,S.* Detailed investigation of selected topics in philosophy. Topics determined by faculty members in consultation with head of the department. Course may be used for individualized study programs.

PHYSIOLOGY

Selected 500-Level Courses Open To Advanced Undergraduates

PHY (ANS) 502 Reproductive Physiology of Vertebrates. *Preq: ZO 421 3(3-0) S.*

PHY (ZO) 503 General Physiology I. *Preqs: Sr. or grad. standing; ZO 421 and BCH 451. 3(3-0) F.*

PHY (ZO) 504 General Physiology II. *Preqs: Sr. or grad. standing and PHY 503. 3(3-0) S.*

PHY (ZO) 513 Comparative Physiology. *Preq: ZO 421 or CI. 3(3-0) S.*

PHY (ANS) 580 Mammalian Endocrine Physiology. *Preqs: BCH 451, ZO 421. 3(3-0) F. Even yrs.*

PEST MANAGEMENT

PM 111 Introduction to Integrated Pest Management. *Preq: BS 100. 2(2-0) S.* Origins, basic principles and objectives, current status and future expectations of integrated pest management (IPM) as a philosophy and technology important for everyone; emphasis on optimum use of natural resources, environmental integrity, and agricultural productivity. HANING

PM (SSC) 370 Alternative Agricultural Systems. *Preq: SSC 200. (3(3-0) S. Alt. even yrs.* Principles and methodologies of alternative agricultural systems (e.g. organic, biodynamic, biological, ecological, permaculture) as related to soil productivity and management, nutrient sources, energy, economics, pest management, pollution and current research. Explore the feasibility of alternative systems or combinations of alternative and conventional systems as viable methods for food and fiber production. KING

PM (MEA, FOR) 386 Agricultural and Forest Meteorology. *Preq: PY 211. 3(3-0) F. Alt. odd yrs.* Basic elements of meteorology: water and energy budgets; instrumentation. Applications selected from weather, remote sensing, irrigation scheduling, climatic classification, plant micrometeorology, meteorological decision-making. DAVIS

PM 495 Special Topics in Integrated Pest Management. *Preq: PM 111. A total of only 6 hours of either PM 495 and/or ALS 400 can be applied towards B.S. degree requirements. 1-6, F,S,Sum.* Application in one or more of the following areas: intensive literature review, work-learning activity, or independent research with instructor guidance, oral presentations to special interest groups, or development of new ideas relating to IPM theory or practice. Projects are selected cooperatively with the Academic Coordinator. Written reports generally are expected. PM 495 may also be used to offer experimental courses.

Selected 500-Level Courses Open to Advanced Undergraduates

PM 590 Advanced Topics in Integrated Pest Management. *Preq: PM 405 or PM 415. 1-6 F,S,Sum.*

PM 595 Topical Problems in Integrated Pest Management. *Preq: PM 415. 2(1-2) S.*

PHYSICAL AND MATHEMATICAL SCIENCES

PMS 100 Orientation to Physical and Mathematical Sciences. *Preq: Undergraduate in College of PAMS. 1(1-0) F.* Introduction to scope and objectives of University education. Emphasis on academic skills as related to academic success. Career discussions, guest lectures, site trips. Departmental advising components.

PMS 110 Physical and Mathematical Sciences Scholars Forum. *Preq: Enrollment limited to participants in the PAMS Scholars Program. 0(2-0) F,S.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

PMS 210 Physical and Mathematical Sciences Scholars Forum. *Preq: Enrollment limited to participants in the PAMS Scholars Program. 0(2-0) F,S.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

POULTRY SCIENCE

PO 201 Poultry Science and Production. *Preq: BS 100. 4(3-3) F,S.* Fundamental principles of broiler, turkey and egg production including poultry physiology, breeding, incubation, housing, nutrition, disease control, management and marketing. PARKHURST

PO (ANS) 204 Feeds and Feeding. *Preq: Sophomore standing. 4(3-3) S.* Applied nutrition of livestock and poultry. Digestion and function of nutrients. Classification, processing and use of feedstuffs. Formulation of rations to meet nutritional requirements. Demonstration of nutritional deficiencies. PARDUE, RAMSEY

PO 301 Evaluation of Live Poultry. *Preq: PO 201. 2(1-3) S.* Experience in evaluating live poultry for production and breeder stock potential. Emphasis on techniques and criteria used in selecting poultry for use in commercial production units. PARKHURST

PO (FS, ANS) 322 Muscle Foods and Eggs. *Preq: BS 100. 3(2-3) F.* Processing and preserving fresh poultry, red meats, seafoods, and eggs. Ante- and post-mortem events as they affect quality, yield and compositional characteristics of muscle tissues. BALL

PO 351 Grading and Evaluation of Poultry Products. *Preq: PO 201. 2(1-3) F.* Experience in grading and evaluating poultry products, such as dressed broilers, fowl, turkeys, shell eggs and broken out eggs. PARKHURST

PO 405 Avian Physiology. *Preq: CH 220. 4(3-3) F.* The principles of avian physiology integrating the physiological processes and the associated anatomical structures that insure the homeostatic state in birds. EDENS

PO 410 Production and Management of Game Birds in Confinement. *Preq: PO 201. 3(2-3) S.* Management principles associated with the successful propagation and rearing of game birds, ornamental birds and waterfowl in confinement. Housing and pen requirements, nutrition, disease control and regulatory issues included. PARKHURST

PO (ANS, NTR) 415 Comparative Nutrition. *Preq: CH 220 or 221 and 223. 3(3-0) F.* Principles of nutrition, including the classification of nutrients and the nutrient requirements of and metabolism by different species for health, growth, maintenance and productive functions. DONALDSON

PO 420 Turkey Production. *Preq: PO 201. 2(1-2) S.* Principles and current practices of turkey production. CHRISTENSEN

PO 421 Commercial Egg Production. *Preq: PO 201. 2(1-2) S.* Principles and current practices of commercial egg production. PARDUE

PO 422 Incubation and Hatchery Management. *Preq: PO 201. 2(1-2) F.* Principles and current practices of incubation and hatchery management. BRAKE

PO 423 Broiler Production. *Preq: PO 201. 2(1-2) F.* Principles and current practices of broiler production; encompassing nutrition, management, poultry health and related areas. PARKHURST

PO 490 Poultry Seminar. *Preq: Sr. standing. 1(1-0) F.* Topics related to current and future problems in poultry science and the poultry industry. Resume writing and interviewing for permanent positions are outlined by faculty and qualified guest lecturers from the poultry industry. Students participate in mock interviews. PARDUE

PO 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

PO 493 Special Problems in Poultry Science. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

PO 495 Special Topics in Poultry Science. *1-3 F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

Selected 500-Level Courses Open To Advanced Undergraduates

PO 505 Physiological Aspects of Poultry Management. *Preqs: PO 201, PO 405 or grad. standing. 3(3-0) S.*

PO (GN) 520 Poultry Breeding. *Preq: GN 411. 3(2-2) S.*

PO (ZO) 524 Comparative Endocrinology. *Preq: ZO 421 or equivalent. 4(3-3) S.*

PLANT PATHOLOGY

PP 315 Principles of Plant Pathology. *Preq: BS 100. 4(3-3) S.* Induction, development and nature of plant diseases caused by fungi, bacteria, viruses, parasitic plants and abiotic factors. Physiological and ecological aspects of host/pathogen biology, and relationship among cultural practices, host resistance, and pesticides in disease control.

PP (FOR) 318 Forest Pathology. *Preq: BS 100 or equivalent. 4(3-2) S.* Major types of diseases of forest trees and deterioration of wood products are studied emphasizing: principles of plant pathology; symptomatology and diagnosis; nature of disease-causing agents; physiology, ecology and dissemination of disease-causing agents; mechanisms of pathogenesis; epidemiology and environmental influences; principles and practices of control.
GRAND

PP 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

PP 493 Special Problems in Plant Pathology. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

PP 495 Special Topics in Plant Pathology. *1-3 F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

Selected 500-Level Courses Open To Advanced Undergraduates

PP 501 Phytopathology I. *Preq: PP 315 or equivalent. 5(3-6) F.*

PP 515 Epidemiology and Plant Disease Control. *Preq: PP 315 or PP 318. 3(3-0) S.*

PP (MB, BO) 575 The Fungi. *Preq: BO 200 or equivalent. 3(3-0) F.*

PP (MB, BO) 576 The Fungi-Lab. *Coreq: BO 575. 1(0-3) F.*

PP 595 Special Problems in Plant Pathology. *Preq: CI. Credits Arranged, Maximum 6.*

POLITICAL SCIENCE

(Also see PA—Public Administration.)

PS 201 Introduction to American Government. *3(3-0) F,S,Sum.* The American federal system, integrating national and state governments, with emphasis on constitutional principles, major governmental organs, governmental functions, and the politics and machinery of elections. Some attention to other types of political systems, and comparisons made where relevant.

PS 202 State and Local Government. *3(3-0). F,S, Sum.* State and local governments within the context of the American federal system. Special emphasis on federalism, the constitutional/legal relationships between state and local governments, and the institutions, organizational forms, and political processes in American state and local government. McCLAIN, WILLIAMS

PS 204 Problems of American Democracy. *3(3-0) Alt. yrs.* Political problems in America from the perspective of political theory. Democracy, economics and politics, racial and sexual equality, civil disobedience, and individual freedom. KESSLER

PS 231 International Relations. *3(3-0) F,S,Sum.* General patterns and attempted control of political interrelationships in the modern state system with emphasis on developments since World War II. Major focus on American and Soviet perceptions of the world, on their foreign policies, and on the increasing impact of Third World nations. GRIFFIN, KEBSCHULL, SINGH

PS 236 Issues in Global Politics. *3(3-0). S.* Major problems confronting the world community, political issues that they raise, and ways in which they are being addressed internationally. Problems include those related to poverty and economic development of the Third World; to population, food resources, the environment; and to wars, arms races, and arms control. SOROOS

PS 241 Introduction to Comparative Politics. *3(3-0).* Introductory comparative analysis of a selected variety of political systems always including some developed democracies, some communist states and some developing countries. A minimum familiarity with the American political system is assumed. KEBSCHULL

PS 250 Principles of Political Science. *3(3-0).* Survey of the nature and varieties of political behavior; concepts and theories of political science; the sources of political science information; and the comparative characteristics of political behavior and institutions, both within and among nation-states. KEBSCHULL

PS 298 Special Topics in Political Science. *3(3-0).* Utilized for experimental courses at the sophomore level.

PS 301 The President and Congress. *Preq: PS 201. 3(3-0) F,S,Sum.* The relationship between the President and Congress in the making of public policy with emphasis on the constitutional, institutional, partisan and personal bases for cooperation and conflict between the two. Emphasis on presidential-legislative interactions in a number of public policy fields. HOLTZMAN

PS 306 Law and Courts in the American Political System. *3(3-0) F,S.* The role of state and federal courts in the political system, including: structure, court organization and legal personnel; the nature of law and its role in society; and functions performed by courts in the political system, from dispute settlement to the initiation of social change. REID, RUBIN

PS 307 Introduction to Criminal Law in the United States. *3(3-0) F,S.* Principles underlying the criminal law in the United States and classification of crimes, criminal act, factors affecting criminal responsibility and various types of offenses. Observation of state and federal court sessions. RUBIN

PS 308 Supreme Court and Public Policy. *3(3-0) F,S.* The role of the Supreme Court in American politics, with emphasis on the use of litigation as a form of political activity. Readings include relevant court cases as well as descriptions of the Supreme Court in action. REID, RUBIN

PS 310 Public Policy. *3(3-0).* Introduction to public policy formulation and analysis, including agenda-setting strategies, problems of legitimation, the appropriations process, implementation, evaluation, resolution, and termination. O'SULLIVAN

PS 311 Criminal Justice Policy Process. *3(3-0) F,S.* Formulation and implementation of policies in various criminal justice institutions. Police agencies, solicitors' offices, courts, prisons and probation and parole departments as public bureaucracies, and interactions of key officials. FAIRCHILD, MOOG

PS 312 Introduction to Public Administration. *Credit for both PS 312 and PS 511 is not allowed. 3(3-0) F,S.* Administration in city, state and national governments: effectiveness and responsiveness, involvement in policy areas, and issues of ethics and responsibilities. COE

PS 314 Science, Technology and Public Policy. *3(3-0).* Societal impacts of current science and technology. U.S. and foreign governmental policy processes and responses. The role of science and technology in alleviating resource scarcities. A comparison of domestic with international science and technology issues.

PS 320 United States Environmental Politics. *3(3-0) S.* Emergence of the environment as an issue in United States politics. Law and policy pertaining to air and water pollution, land-use, water, energy, toxic substances, and wilderness. Roles of national and state governments, scientists, corporations, and citizens groups in addressing environmental problems. Contemporary thought on political ecology.

PS 331 U. S. Foreign Policy. *3(3-0) F,S,Sum.* The content, formulation, and execution of U.S. foreign policy during the postwar period, with concentration on major issues and trends, the instruments for implementing foreign policy, and analysis of the policymaking process. GILBERT

PS 332 Soviet Foreign Policy. *3(3-0) S.* Elements of continuity and change in Soviet foreign policy are examined within the context of Soviet ideology and national interest. Special attention is given to the decision-making structures within the Soviet Union and to relations with the West since World War II. MASTRO

PS 336 Global Environmental Politics. *3(3-0) F.* Political aspects of global ecological problems, particularly population, food, energy, minerals, renewable resources, pollution, and extinction of species. Relevant national and international policies, including management of oceans, the seabed, Antartica, and outer space. SOROOS

PS 342 Political Systems of China and Japan. *3(3-0).* A comparative analysis of the structure and processes of politics in China and Japan. WILLIAMS

PS 343 Southeast Asia: Internal Politics and External Relations. *3(3-0).* Domestic and international politics in the region from Burma to the Philippines. Contemporary issues involving relations among Vietnam, ASEAN, China, Japan, the USSR, and the USA in the context of the internal political dynamics of the ten countries of Southeast Asia.

PS 344 Soviet Politics. *3(3-0) F.* Contemporary Soviet political system with consideration given to the historical and ideological base of Soviet politics, comparisons with other political systems. MASTRO

PS 345 Governments and Politics in the Middle East. *3(3-0).* Contemporary politics of the Middle East. Emphasis on the historical, geographic, religious, and political-economic factors of the region and the individual countries. Attention to the foreign policies of the superpowers in the region as well as to the Arab-Israeli conflict, Middle Eastern oil, and revolutionary developments in Iran and elsewhere. MOOG

PS 346 Comparative Political Systems of Asia. *Preq: PS 201. 3(3-0) F,Sum.* Comparative political systems of selected Asian countries: political structures, current problems and future prospects that face these countries in their bid to modernize in a traditional setting. SINGH

PS 361 Introduction to Political Theory. *3(3-0) F.* Basic questions about the nature and purpose of politics, as treated by such writers as Plato, Aristotle, St. Augustine, Machiavelli, Locke, Rousseau, Tocqueville, Marx, and Nietzsche. KESSLER

PS 362 American Political Thought. *3(3-0) S.* American ideas and institutions as viewed from the perspective of great American political thinkers, including Thomas Jefferson, James Madison, Alexander Hamilton, Henry David Thoreau, Abraham Lincoln, Franklin Roosevelt, Frederick Douglass, and Malcolm X. KESSLER

PS 371 Research Methodology of Political Science. *Preq: PS 201. 3(3-0) F,S.* Principles and procedures of political science research including the philosophy of science; theory construction; sampling, measurement and research designs; computer applications, mainframe and microcomputing. O'SULLIVAN, VASU, WILLIAMS

PS 374 Microcomputer Applications in Political Science. *Preq: Sophomore standing and 3 hours PS. 3(3-0) F.* An introduction to microcomputer applications in political science. GARSON

PS 401 American Parties and Interest Groups. *3(3-0) F.* Impact of American political system upon parties and interest groups; their influence upon that system. American parties and interest groups as instruments for mobilizing electorates, choosing and organizing government leaders, affecting public policy and administration. Strategies, tactics and problems of American parties and interest groups. HOLTZMAN

PS 402 Campaigns and Elections in the U.S. Political System. *Preq: PS 201. 3(3-0).* Campaigns and elections in the United States with emphasis on presidential and congressional primary and general elections. Development of theoretical propositions concerning how and why people vote, how and why candidates campaign, and behavioral reasons underlying candidates' successes and failures. Special emphasis on the role of the mass media in the electoral process. DORFF

PS 406 Politics and Policies of American State Governments. *3(3-0).* A comparative study of the politics and policies of the 50 states. Socioeconomic and political variations and state response to intergovernmental domestic programs. An analysis of state policy, e.g., in the areas of criminal justice, health, transportation, regulation and urban planning. McCLAIN, WILLIAMS

PS 408 Urban Politics. *3(3-0).* An introduction to politics and policies in urban areas. Topics include comparisons among rural and urban areas, various regions of the U.S., and communities of varying size. The course embodies both an intergovernmental and a policy approach. Policy topics included are planning and growth management, education, housing, welfare, health, transportation, environmental and energy issues, and public safety. SVARA

PS 411 Public Opinion and the Media in American Politics. *Preq: PS 201. 3(3-0) F,S, Alt. yrs.* Nature, content, origins, and effects of public opinion in the American political system; role of the mass media in articulating and shaping public opinion; issues concerning measurement of public opinion. DORFF, VASU

PS (SOC) 413 Criminal Justice Field Work. *Preqs: Acceptance in criminal justice option; senior standing; SOC 306 and PS 311. 4(2-8) F,S.* (See Sociology.)

PS 415 Administration of Justice. *Preqs: PS 311 and junior standing. Credit will not be given for both PS 415 and PA 515. 3(3-0) F.* Politics and administration in the American system of justice. FAIRCHILD

PS 431 International Law and Organization. *3(3-0) S.* The nature, development and function of international law and international organization as applied to international conflict and cooperation. Special emphasis on the United Nations as both a legal and a political instrument. SINGH

PS 433 Global Problems and Policy. *Credit will not be given for both PS 433 and PS 533. 3(3-0) S. Alt. yrs.* International policy processes and policy responses to problems of global scope, including economic developments, human rights, and other policy problems selected for specific semesters. Independent research on a global policy problem of student's choice. SOROOS

PS 437 National Security Policy. *Preq: PS 331. 3(3-0).* An examination of the formulation and implementaion of contemporary United States national security policy. Emphasis is on defense policy, and attention is also given to economic issues. DORFF, GILBERT

PS 441 Military Coups & Regimes in the Third World. *Preq: Six hours of political science. Credit will not be given for both PS 441 and PS 541. 3(3-0). F.* The seizure and

exercise of political power by military forces in Asia, Africa, and Latin America. Causes and techniques of military coups with emphasis on the social, economic and political policies of military regimes. Case studies within the context of theories about the political role of the military. KEBSCHULL

PS 442 Western European Politics. *Preq: 6 hours political science. Credit will not be given for both PS 442 and PS 542. 3(3-0) S.* Political institutions and processes in selected Western European states and in the European Community. Major social, economic and political issues confronting European societies. KEBSCHULL

PS 445 Comparative Systems of Law and Justice. *Preqs: PS 311 and junior standing. Credit will not be given for both PS 445 and PS 545. 3(3-0) F,S.* Legal culture and administration of justice in various countries and in the U.S. Emphasis on the impact of legal ideology on crime, political justice, police administration, corrections and judicial process. FAIRCHILD, MOOG

PS 446 Comparative Communist Systems. *Preq: PS 344 or 332. 3(3-0) F.* A study of the international sub-system of states ruled by the Community Party and the international Communist movement. Focuses on the Soviet, Chinese, and Yugoslavian systems as models with emphasis placed on the institutional, political, and ideological similarities and differences within the Communist world. MASTRO

PS 462 Seminar in Political Theory. *Preq: PS 361 or consent of instructor. 3(3-0) S.* A special area in political theory through selected texts, independent research, and seminar reports. Topics vary from year to year, such as ancient and modern political thought, democratic theory, and political theory in literature. KESSLER

PS 471 Public Opinion Research Methodology. *3(3-0) F,S.* Survey research methodology in public opinion polling, campaign management, media and market research, needs assessment and program evaluation. Topics include questionnaire design, survey sampling, computer applications, and data analysis. VASU

PS 490 Readings and Research in Political Science. *Preq: Consent of department. 1-6 F,S.* Extensive readings or research in political science under direct faculty supervision.

PS 491 Internship in Political Science. *Preq: Consent of instructor. 1-6 F,S,Sum.* Internship in a governmental agency, interest group, or like organization involves seminar or formal report. McCLAIN

PS 492 Honors Readings and Thesis in Political Science. *Preq: Admission to Honors Program and CI. Enrollment limited to Political Science honors majors. 3-6 F,S,Sum.* Independent reading and preparation of an honors thesis in political science.

PS 498 Special Topics in Political Science. *Preq: Six hours PS. 3-6 F,S.* Detailed investigation of a topic. Topic and mode of study determined by the student and a faculty member.

Selected 500-Level Courses Open To Advanced Undergraduates

PS 502 The Legislative Process. *Preq: Advanced undergrad. standing including 12 hours of political science, grad. standing or PBS status. 3(3-0) S.*

PS 506 American Constitutional Theory. *Preq: Advanced undergrad. standing including 12 hours of political science, grad. standing or PBS status. 3(3-0) F.*

PS 507 Constitutional Theory II. *Preq: Advanced undergrad. standing including 12 hours of political science, grad. standing or PBS status. 3(3-0) S.*

PS 514 Public Finance. *Preq: EB 205. 3(3-0) F.*

PS 531 International Law. *Preq: Grad. or advanced undergrad. standing. 3(3-0).*

PS 571 Research Methods and Analysis. *Preqs: Advanced undergrad. standing including 12 hrs. of PS, grad. standing or PBS status. 3(3-0).*

PS 598 Special Topics in Political Science. *Preq: 6 hours of political science. 1-6 F,S.*

PSYCHOLOGY

PSY 200 Introduction to Psychology. *3(3-0) F,S,Sum.* Survey of basic principles for the understanding of behavior and experience including development, learning, cognition, biological foundations, perception, motivation, personality, behavior abnormalities, measurement of individual differences, and social processes. The value of scientific observation and experimentation to the development of psychological understanding is emphasized.
CUNNINGHAM, KALAT, LUGINBUHL, MERSHON, NACOSTE, POND

PSY 210 Applied Psychology. *Preqs: PSY 200, Juniors and Seniors are advised to take PSY 412, rather than PSY 210. 3(3-0) S.* Areas of practical application of psychology. Specific content may vary from semester to semester. Typically includes illustrative cases of psychological practice in mental health, environmental design, marketing, crime control, education and work settings.
SMITH

PSY (ST) 240 Introduction to Behavioral Research I. *Preq: PSY 200; Coreq: PSY (ST) 241. For PSY and HRD majors only. 3(3-0) F,S.* Introduction to quantitative methods in psychology, including measurement, experimental control, validity, and fundamentals of research design. Discussion of distributions and statistical inference.
COLE, KLEIN, LEVERE

PSY (ST) 241 Introduction to Behavioral Research I Lab. *Preq: PSY 200; Coreq: PSY (ST) 240. For PSY and HRD majors only. 1(0-2) F,S.* Students design, analyze and report a variety of simple experiments.
COLE, KLEIN, LEVERE

PSY (ST) 242 Introduction to Behavioral Research II. *Preq: PSY (ST) 240; Coreq: PSY (ST) 243. For PSY and HRD majors only. 3(3-0) F,S.* Continuation of PSY (ST) 240. Ethics of Research in Psychology. Techniques for the development of research proposals. Statistical techniques for data analysis including non-parametrics, one-way and two-way ANOVA and introduction to correlation and regression.
COLE, KLEIN, LEVERE

PSY (ST) 243 Introduction to Behavioral Research II Lab. *Preq: PSY (ST) 240; Coreq: PSY (ST) 242. For PSY and HRD majors only. 2(0-4) F,S.* Design and analysis of a major research project.
COLE, KLEIN, LEVERE

PSY 300 Perception. *Preqs: PSY 200. 3(3-0) F,S,Sum.* An introduction to anatomy and physiology of major sensory systems, their relation to central structures, and basic problems dealt with by psychophysics. Examination of the chief determiners of perception, including both stimulus variables and such organismic variables as learning, motivation, and attention. The discussion of perceptual theory and processes emphasizes topics in two-and three-dimensional spatial perception.
MERSHON

PSY 304 Educational Psychology. *3(3-0) F,S,Sum.* An introduction to psychological principles that apply to education. These principles include: cognitive and personality development, motivation, classroom management, learning, memory, thinking and problem solving, measurement and evaluation, individual differences, intelligence, exceptionality and multicultural education.
HASKETT, HESS

PSY 307 Industrial and Organizational Psychology. *Preq: PSY 200, juniors and seniors. 3(3-0) S, Sum.* Surveys the application of psychological theories and methods to problems involving people in working settings. Topics include: organizational and management theory; work motivation and job satisfaction; job and organizational analysis; performance evaluation; personnel recruitment, selection, and placement; and personnel training and development.
CUNNINGHAM

PSY 310 Learning and Motivation. *Preq: PSY 200. 3(3-0) F,S,Sum.* Introduction to the primary laboratory research areas in learning and motivation: classical conditioning, operant conditioning, verbal learning, drive theory, and the role of motives. Emphasis upon research on conditioning and its motivational processes as the foundations for techniques in behavior modification. Examination of both the uses and limitations of current information on learning and motivation.
COLE

PSY 320 Cognitive Processes. *Preq: PSY 200. 3(3-0) F,S,Sum.* Introduction to research and theory in cognition including such topics as memory, acquisition and use of language, reading, problem solving, reasoning, and the acquisition and use of concepts. NEWMAN

PSY 330 Biological Psychology. *Preq: PSY 200. BS 100 or 105 is recommended. 3(3-0) F.* Biological mechanisms of behavior, including elementary neuroanatomy and neurophysiology, sensory and motor processes, and their application to motivation, learning, and psychological processes. KALAT

PSY 340 Ergonomics. *Preq: PSY 200. 3(3-0) F.* Concepts from ergonomics, environmental psychology, and cognitive psychology related through design examples to problems of everyday living. Criteria of efficiency, comfort and safety evaluated relative to the design of activity, products, and the environment. Topics include: visual and auditory perception, information processing, physical activity, noise and lighting, work space design, workload, and product design. CONVERSE

PSY 350 Human Resource Development Skills. *Preq: Junior standing; Coreq: PSY 495, SP 112. For HRD majors only. 3(3-0) F.* Instruction, practice and development of skills in the psychology of behavior observation, interviewing, instruction and organizing. Emphasis on issues relevant to human service providers in public and private settings. GRAY

PSY 370 Personality. *Preq: PSY 200. 3(3-0) F,Sum.* Major personality theories. Definition of personality associated with each theory as well as the assumptions and principles used in accounting for human behavior. Theories evaluated considering recent research.

PSY 376 Developmental Psychology. *Preq: PSY 200 or 304. 3(3-0) F,S,Sum.* Behavioral development during life span, including study of current theories and project work with persons at various stages of the life cycle. BAKER-WARD, HALBERSTADT, SNYDER

PSY 411 Social Psychology. *Preq: PSY 200. 3(3-0) F,S.* Basic theory and research on how the average person responds to social stimuli, and how these responses are perceived and responded to by others. Topics include affiliation, attraction, interpersonal perception, altruism, aggression, attitude formation and change, conformity, group dynamics, and environmental psychology. LUGINBUHL, NACOSTE

PSY 412 Applied Psychological Research. *Preqs: PSY 200; STA 311 or both PSY 240 and 242. 3(3-0) F.* Guided practice in applied research for students in psychology and related disciplines. Problem definition, research design, measurement, statistical analysis, and computer processing. SMITH

PSY (PHI) 425 Introduction to Cognitive Science. *Preq: One upper-level course in either PHI, PSY, CSC or Linguistics, or permission of instructor. Credit cannot be given for both PHI/PSY 425 and PHI/PSY 525. 3(3-0) F.* Philosophical foundations and empirical fundamentals of cognitive science, an interdisciplinary approach to human cognition. Topics include: the computational model of mind, mental representation, cognitive architecture, the acquisition and use of language.

PSY 436 Introduction to Psychological Measurement. *Preqs: PSY 240 sequence or ST 311. 3(3-0) S, Alt. yrs.* Emphasizes measurement in the science of psychology, controlled experiments, and studies of individual differences. Principles relating to applied problems are discussed, but more emphasis is placed on principles which relate to psychology as a science. WESTBROOK

PSY 470 Abnormal Psychology. *Preq: PSY 200 or 304. 3(3-0) S,Sum.* Common psychological disorders of children and adults. Historical and theoretical perspectives on abnormal behavior; issues of assessment and classification; etiology, symptoms, and treatment of disorders. ERCHUL, WALKER

PSY 475 Child Psychology. *Preq: PSY 200 or 304; PSY 376. 3(3-0) F,Sum.* Intellectual, social, emotional and personality development of the child. Physical growth discussed as needed for an understanding of the psychologic development of the child. BAKER-WARD, HESS, WALKER

PSY 476 Psychology of Adolescent Development. *Preq: PSY 200 or PSY 304. 3(3-0) F,S,Sum.* Theories, principles, and issues related to human psychological development and emphasizing the period of adolescence. Consideration of cognitive, social, and physiological changes; their interaction; and implications for the teaching and parenting of adolescents. SNYDER

PSY 491 Special Topics in Psychology. *Preq: PSY 200. 3(3-0) F,S.* Exploration in depth of advanced areas and topics of current interest in psychology.

PSY 495 Human Resource Development Practicum. *Preq: Jr. standing. For HRD majors only. 3-8 F,S.* Field experience in the use of skills acquired during the skill semester. The student will work at an off-campus site during two consecutive semesters. GRAY

PSY 498 Psychology Honors Seminar. *Preq: Permission of department; HRD and PSY honors students. Must take two semesters. 3(1-4) As needed.* Seminar and independent study under faculty direction. Provides the undergraduate psychology honors students with opportunity to practice skills in designing, conducting, and evaluating research. The student, working closely with a faculty advisor, designs a research approach to a particular body of literature, accumulates appropriate data, and analyzes and evaluates the data.

PSY 499 Individual Study in Psychology. *Preq: Permission of the Department; Coreq: PSY 495 for HRD majors during their work semester. 1-6 F,S.* Individual research project (literature review, experiment, survey, field study) open to any undergraduate, under the direction of a Psychology Department faculty member.

Selected 500-Level Courses Open To Advanced Undergraduates

PSY 502 Physiological Psychology. *Preq: Twelve hours of PSY including PSY 200, 300, 310. 3(3-0) F.*

PSY 504 Advanced Educational Psychology. *Preq: Six hours of PSY. 3(3-0) F.*

PSY 505 History and Systems of Psychology. *Preqs: PSY 200, 300, 310, 320 or CI or grad. status. 3(3-0) S.*

PSY 530 Advanced Abnormal Psychology. *Preqs: PSY 200, 370. 3(3-0) S.*

PSY 533 Biological Factors in Abnormal Behavior. *Preqs: 6 hours of PSY and 6 hours of biology. 3(3-0) Alt. Sum.*

PSY 535 Tests and Measurements. *Preq: Six hours of PSY. 3(3-0) F,S,Sum.*

PSY (IE) 540 Human Factors in Systems Design. *Preq: IE (PSY) 338 or IE 354; Coreq: ST 507 or 515. 3(3-0).*

PSY 565 Organizational Psychology. *Preq: Nine hours of PSY. 3(3-0) F.*

PSY 576 Advanced Developmental Psychology. *Preq: Nine hours of PSY, including PSY 376, PSY 475 or PSY 476. 3(3-0).*

PSY 577 Adolescent Development. *Preq: Six hours of PSY or CI. 3(3-0).*

PSY 591 Special Topics in Psychology. *Preq: 6 hours of PSY; Coreq: 3 hours of ST. 1-3 F,S.*

PSY 594 Area Seminar in Human Resources Development. *Preq: CI. 1-3, Max. 6. F,S.*

PHYSICS

PY 101 Perspectives on Physics. *Preq: Course available for Physics Majors only. 1(1-0) F.* Orientation to the current practice of physics, including discussion of historical background, scientific viewpoint, current topics, and careers in physics. Visits to departmental research laboratories. PAESLER

PY 201 University Physics I. *Preq: MA 141; Coreq: MA 241. 4(3-3) S.* First course of three semester sequence for students majoring in physical and mathematical sciences. Calculus is used throughout. Principles of classical Newtonian mechanics are covered in detail.

PY 202 University Physics II. *Preqs: PY 201, MA 241. 4(3-3) F.* Second course of three semester sequence designed primarily for students majoring in physical and mathematical sciences. Calculus is used throughout. Principles of electricity and magnetism are covered in detail.

PY 203 University Physics III. *Preqs: PY 202, MA 242. 4(3-3) S.* Third course of three semester sequence designed primarily for students majoring in physical and mathematical sciences. Calculus is used throughout. Principles of wave optics and modern physics are covered in detail.

PY 204 General Physics. *Preq: MA 141. Credit cannot be earned for both PY 204 and PY 205. 3(3-0).* Introduction to physics, including the study of mechanics, sound, heat, and thermodynamics. The analytical approach is employed with emphasis on problem solving. Identical to PY 205, except that there is no laboratory. Offered only through Independent Study by Extension.

PY 205 Physics for Engineers and Scientists I. *Preq: MA 141 with a grade of C or better. 4(3-3) F,S,Sum.* First semester of a two-semester sequence in introductory physics, with laboratory. A calculus-based study of mechanics, sound, and heat. JENKINS

PY 206 General Physics Laboratory. *Preq: PY 204. Enrollment subject to approval of Physics Department, and limited to students who have passed PY 204. Not open to students having credit for PY 205. 1(0-2) F,S,Sum.* Laboratory part of PY 205. Approximately ten experiments taken from the fields of mechanics, sound, heat and thermodynamics.

PY 207 General Physics. *Preq: PY 205 or PY 204. Credit cannot be earned for both PY 207 and PY 208.* Introduction to physics, including the study of electricity and magnetism, optics, and modern physics. The analytical approach is employed, with emphasis on problem solving. Identical to PY 208, except that there is no laboratory. Offered only through Independent Study by Extension.

PY 208 Physics for Engineers and Scientists II. *Preqs: PY 205 and MA 241 with grade of C or better. 4(3-3) F,S,Sum.* Second semester of a two-semester sequence in introductory physics, with laboratory. A calculus-based study of electricity, magnetism, optics, and modern physics. JENKINS

PY 209 General Physics Laboratory. *Preq: PY 207. Open only to students who have passed PY 207. Not open to students who have credit for PY 208. Enrollment subject to approval of Physics Department.* Approximately 10 experiments taken from the field of electricity and magnetism, optics, and modern physics.

PY 211 College Physics I. *(Non-Calculus) Preq: MA 111 or 116. Credit not allowed for both 211 and either 201 or 205. 4(3-2) F,S,Sum.* First semester of a two semester introductory sequence in non-calculus physics, with laboratory. Mechanics, heat, wave motion and sound.

PY 212 College Physics II. *(Non-Calculus) Preq: PY 211; Credit not allowed for both 212 and either 202 or 208. 4(3-2) F,S.* Second semester of a two semester introductory sequence in non-calculus physics, with laboratory. Electricity, and magnetism, light, modern physics.

PY 221 College Physics. *Preq: MA 115. 5(5-0) F,S,Sum.* A non-calculus introduction to the principles of physics, including mechanics, electricity and magnetism, waves, and light. Covers selected topics from PY 211-212. No associated laboratory.

PY 223 Astronomy. *3(3-0) F,S,Sum.* An introductory, descriptive survey of the field of astronomy, designed primarily for the non-science major. History of astronomy; the solar system, with current results from space probes; the sun and other stars, galaxies; and cosmology. Exotic recent discoveries such as quasars, pulsars, and black holes included. A companion laboratory course (PY 225) offers an introduction to astronomical observing.

PY 225 Astronomy Laboratory. *Coreq: PY 223. 1(0-2) F,S.* Introduction to astronomical observing. Twelve exercises include astronomical instruments; the nature of light; Kepler's and Newton's laws of motion; the constellations; planets, binary stars, stellar clusters, and galaxies. Use of small telescopes to observe celestial objects.

PY 228 Introduction to Stellar Astrophysics. *Preq: PY 202 or PY 208. 3(3-0) S.* Introduction to the study of stars, galaxies, and the universe. Stars and stellar evolution; interstellar medium; galaxies and galaxy cluster; cosmology. Recent developments in the understanding of neutron stars, black holes, active galaxies, quasars, and inflationary cosmologies.

PY 231 Physics for Non-Scientists. *For humanities and social science students only. 4(3-2) F,S,Sum.* The history, philosophy, methods and fundamental concepts of physics with applications to everyday modern living. Topics in mechanics, heat, electricity, light, relativity, quantum concepts, and atomic and nuclear phenomena.

PY 240 Exophysics. *Preq: One of PY 201, 205, 211, 223. 3(3-0) F.* A wide range of principles of physics is employed to examine problems in exophysics. Topics include conditions for life on other planets, possibility of extraterrestrial intelligence and the problems of interstellar communications.

PY 299 Special Problems in Physics. *Preq: Consent of department. 1-3. F,S.* Study in experimental or analytical topics in classical and modern physics.

PY 401, 402 Quantum Physics I, II. *Preq: PY 411. 3(3-0) F,S.* An introduction to the basic principles of quantum physics with an emphasis on selected applications to atoms, molecules, solids, nuclei, and elementary particles.

PY 407 Introduction to Modern Physics. *Preqs: MA 242, PY 208. 3(3-0) F,S.* Major developments in modern physics: special relativity, origin of the quantum theory, atomic and molecular structure, structure of solids, properties of nuclei and elementary particles.

PY 410 Introduction to Modern Physics for Nuclear Engineers. *Preqs: PY 202 or 208; NE 202; Credit for both PY 203 and either 407 or 410 is not allowed. 3(3-0) S.* Atomic and nuclear physics fundamentals for nuclear engineering students. Simple concepts of relativity; quantization of charge, light and energy; the nuclear atom and the Bohr model of the hydrogen atom; the wave nature of matter; the Schroedinger equation; atomic physics; properties of nuclei, nuclear reactions and nuclear models. SEAGONDOLLAR

PY 411 Mechanics I. *Preqs: PY 203 or 208, MA 341. 3(3-0) F.* First semester of a two semester sequence in intermediate classical mechanics of particles and systems of particles. Solutions of problems in Newtonian mechanics; one dimensional motion; linear, damped, driven oscillations; two particle collisions; introduction to Lagrangian and Hamiltonian dynamics.

PY 412 Mechanics II. *Preq: PY 411. 3(3-0) S.* Continuation of PY 411 with emphasis on Langrangian techniques: central force motion, rotating coordinate systems, rigid body dynamics, coupled oscillations. Elements of special relativity.

PY 413 Thermal Physics. *Preqs: PY 203 or 407, MA 341. 3(3-0) S.* An introduction to statistical mechanics and thermodynamics. The statistical study of physical systems emphasizing the connection between the statistical description of macroscopic systems and classical thermodynamics. Concepts of heat, internal energy, temperature and entropy. Classical and quantum statistical distributions.

PY 414 Electromagnetism I. *Preqs: PY 203 or 208, MA 341. 3(3-0) F.* The first semester of a two semester sequence. An intermediate course in electromagnetic theory using the methods of vector calculus. Electrostatic field and potential, dielectrics, solution to Laplace's and Poisson's equations, magnetic fields of steady currents.

PY 415 Electromagnetism II. *Preq: PY 414. 3(3-0) S.* A continuation of PY 414. Electromagnetic induction, magnetic fields in matter, Maxwell's equations, wave guides, radiation.

PY 441 Spacetime Physics. *Preq: PY 203 or 407. 3(3-0) S.* Introduction to spacetime physics in accordance with Einstein's special theory of relativity: time dilation, twin paradox, Doppler effect, relativistic space travel, four-vectors, relativistic momentum and energy conservation laws in high energy physics. Consequences of Einstein's gravitational theory in cosmology: models of the expanding universe, neutron stars, black holes and the "big bang" hypothesis.

PY 451 Electronics for Physicists. *Preq: PY 414; Coreq: PY 415. 3(1-4) S.* Analog and digital electronics laboratory course serving as an introduction to the use of modern instrumentation required for experimental research in physics. Bipolar and field effect transistors, operational amplifiers, oscillators, power supplies, analog-digital and digital-analog conversion, and digital logic circuits.

PY 452 Advanced Physics Laboratory. *Preqs: Senior standing and consent of department. 1-2 F,S.* Experiments in mechanics; electromagnetism; optics; and atomic, nuclear, plasma, and solid state physics. GOULD

PY 499 Independent Research in Physics. *Preq: Consent of department. 1-6 F,S,Sum.* Study and research in physics. Topics for experimental or theoretical investigation.

Selected 500-Level Courses Open To Advanced Undergraduates

PY 506 Nuclear and Subatomic Physics. *Preqs: PY 203 or 407; PY 412. 3(3-0) F.*

PY 508 Ion and Electron Physics. *Preq: PY 414. 3(3-0) F.*

PY 509 Plasma Physics. *Preq: PY 414. 3(3-0) F.*

PY 510 Nuclear Physics II. *Preq: PY 410. 4(3-2) S.*

PY (NE) 511 Nuclear Physics for Engineers. *Preq: PY 410. 3(3-0) F.*

PY 516 Physical Optics. *Preq: PY 415. 3(3-0) F.*

PY 517 Atomic and Molecular Physics. *Preqs: PY 401, 412. 3(3-0) S.*

PY 521 Statistical Physics I. *Preqs: PY 401, PY 413. 3(3-0) S.*

PY 543 Astrophysics. *Preqs: PY 203 or 407; PY 411. 3(3-0) S.*

PY (ECE) 552 Introduction to the Structure of Solids. *Preq: PY 401. 3(3-0) S.*

PY 553 Introduction to the Structure of Solids II. *Preq: PY 552 or equivalent. 3(3-0) F.*

PY (MA) 555 Mathematical Introduction to Celestial Mechanics. *Preq: MA 341. 3(3-0) F.*

PY (MA) 556 Orbital Mechanics. *Preqs: MA 341, 405, knowledge of elementary mechanics and computer programming. 3(3-0) S.*

PY 590 Special Topics in Physics. *Preq: Consent of department. Credits arranged. F,S.*

RELIGION

(Also see PHI—Philosophy.)

REL (FLH) 101 Elementary Biblical Hebrew I. *3(3-0) F.* The elements of grammar and syntax essential for a reading knowledge of Biblical Hebrew. Reading is drawn primarily from the Book of Genesis and some attention given to exegetical method. VANDERKAM

REL (FLH) 102 Elementary Biblical Hebrew II. *Preq: REL (FLH) 101. 3(3-0) S.* A continuation of REL (FLH) 101 with increased emphasis upon reading selected prose passages. VANDERKAM

REL (FLH) 201 Intermediate Biblical Hebrew I. *Preq: REL (FLH) 102. 3(3-0) F.* Continuing development of vocabulary and understanding of grammar and syntax through reading of selected prose and poetic passages in the Hebrew Bible. Exegetical matters are considered. VANDERKAM

REL (FLH) 202 Intermediate Biblical Hebrew II. *Preq: REL (FLH) 201. 3(3-0) S.* Exclusive attention devoted to reading and interpreting selected prose and poetic passages in the Hebrew Bible. VANDERKAM

REL 298 Special Topics in Religion. *3(3-0).* Selected studies in religion that do not appear regularly in the curriculum. Topics will be announced for each semester in which the course is offered.

REL 300 Religious Traditions of the World. *3(3-0) F,S,Sum.* Major Eastern and Western religious traditions with attention to their basic teachings and practices as well as to the historical, geographical, social, and political settings in which they have arisen and developed.

REL (SOC) 309 Religion and Society. *3(3-0).* See Sociology Department.

REL 311 Introduction to the Old Testament. *3(3-0) F,S,Sum.* Study of Old Testament books, examining their content, background, and development. Comparisons of the biblical material with other Ancient Near Eastern literature. Assessment of contributions from archeology and literary studies to clarifying the text. VANDERKAM

REL 312 Introduction to the New Testament. *3(3-0) F,S,Sum.* Literary and historical study of the New Testament in its Jewish and Greco-Roman contexts. Special attention to distinctive characteristics of the Gospels and their relationships, early controversies with Judaism and the emergence of church structure and teaching. ADLER

REL 314 Introduction to Intertestamental Literature. *3(3-0) S.* Intertestamental literature in the context of Jewish history, institutions, and beliefs of the Intertestamental Period (ca. 300 B.C.-ca. 100 A.D.) VANDERKAM

REL 317 Christianity. *3(3-0) F,S.* The development of Christianity from its origins to the present, noting the events, persons, ideas, beliefs, and practices which were most significant in this development. CUNNINGHAM

REL 318 Protestant Christianity. *3(3-0) S.* The distinctive characteristics of Protestant Christianity, primary theological emphases, major denominational forms, and cultural influences from the 16th century to the present.

REL (HI) 320 Religion in American History. *3(3-0) F.* Representative people, movements, and thought in the major religions within the context of American society and culture. MULLIN

REL 323 Religious Cults, Sects, and Minority Faiths in America. *3(3-0) F,S.* Religious cults, sects, and minority faiths in America, including Mormonism, Christian Science, and Jehovah's Witnesses. Also covers such alternate groups as the holiness-charismatic movement and the Unification Church. Origins, development, and teachings of these groups within the context of American culture and religion. MULLIN

REL (HI) 324 American Religion After Darwin. *3(3-0) S.* An analysis of major religious issues from the Civil War to the mid-1920s. Topics include the relationship of science to religion, especially the impact of Darwin's evolutionary theory; biblical criticism; liberalism versus fundamentalism; the churches in an industrial society; the crusade against alcohol; the foreign missionary movement; and religious attitudes toward work, leisure, the family, and sex. MULLIN

REL 326 The Catholic Traditions. *3(3-0) S.* The history, basic teaching, and cultural influences of Roman Catholicism and Eastern Orthodoxy. MULLIN

REL 327 Issues in Contemporary Religion. *3(3-0) F,S.* Responses of contemporary Western religious thinkers to critics of religion and to challenges posed by the 20th century, including the Nazi Holocaust, social injustice (liberation theologies—black, feminist, Third World), ecological crisis, threat of nuclear warfare, and conflicts between religious. CUNNINGHAM

REL 331 The Hindu Tradition. *3(3-0) F,S.* Basic religio-philosophical concepts, social institutions, and individual practices of Hindu civilization from earliest Vedic times to the present. Focus on major traditions: Action (karma), Knowledge (jnana), and Devotion (bhakti), with emphasis on disciplines (yoga), myth, symbol, art. STEWART

REL 332 The Buddhist Tradition. *3(3-0) F.* History and structure of the Buddhist tradition analyzed through the "three jewels": the Buddha, the Monastic Community (sangha), and the Teachings (dharma). Emphasis on fundamental religio-philosophical concepts, social history and ritual practices of Southern Buddhism, early Mahayana development, and Tantric ideals. Growth of the traditions in China and Japan. STEWART

REL (HI) 407 Islamic History to 1798. *Preq: 3 hours of history. 3(3-0) F,S.* (See History Department.)

REL (HI) 408 Islam in the Modern World. *Preq: 3 hours of history. 3(3-0) Alt. Yrs.* (See History Department.)

REL 498 Special Topics in Religion. *Preq: Six hours REL. 1-6 F,S.* Detailed investigation of selected topics in religion. Topics determined by faculty members in consultation with head of the department. Course may be used for individualized study programs.

RECREATION RESOURCES ADMINISTRATION

RRA 101 Recreation Resources Orientation Laboratory. *1(0-3) F,S.* Introduction to the Department of Recreation Resources Administration, to the profession of park, recreation and tourism services and to the career opportunities in the delivery of these services. LOVE

RRA 152 Introduction to Recreation. *3(3-0) F,S,Sum.* Introduction to the professional field of recreation by presenting the basic principles, fundamentals and concepts of recreation as related to such factors as: recreation history and objectives, sociological and economic aspects of recreation, leadership qualities and facility provision; and settings for organized recreation in modern society. LOVE, WARREN

RRA 200 Exploring Leisure Alternatives. *3(3-0) F,S,Sum.* Leisure as a lifelong resource for human satisfaction and fulfillment; its potential for physical, mental, social and emotional growth and development of the individual. Leisure opportunity areas presented and evaluated. HARPER, LOVE

RRA 215 Park and Recreation Maintenance Management. *Preq: RRA 152. 3(3-0) F.* Methods of maintaining various park, recreation and leisure service facilities for public use; maintenance job planning and scheduling; preventive maintenance; current maintenance materials and equipment. STERNLOFF, WARREN

RRA 216 Managing Park and Recreation Facilities. *Preq: RRA 152. 3(3-0) S.* Managing aquatic recreation resources including swimming pools, beaches, large and small lakes, marinas, and rivers; family campgrounds and golf courses. WARREN

RRA 220 Commercial Recreation and Tourism. *Preq: RRA 152. 3(3-0).* Commercial recreation and the tourism industry; including its origin, present characteristics, behavioral foundations, and societal impacts. Emphasis on recreation administration in the commercial sector. BROTHERS, GUSTKE

RRA 241 Natural Resource Recreation. *Not open for RRA majors. 3(3-0) S.* The concepts and principles involved in identifying and describing natural resource components significant to recreation and management. The relationships between various governmental agencies and private enterprises in providing natural resource-based recreation opportunities are examined. Outdoor recreation policy is reviewed as it related to the management of natural resources.

RRA 320 Convention and Visitor Services. *Preq: RRA 152. 3(3-0) every third semester.* Programmatic issues of facilitating conventions, visitor services and special events, including convention operations, development and operation of visitor service programs, and special event programming. GUSTKE

RRA 350 Outdoor Recreation Management. *Preq: RRA 152. 3(2-3) F.* Special problems of resource-based recreation management are studied. Special attention is given to developing an understanding of how agency philosophy and mission translate into managerial action. A management plan will be developed and an overnight weekend field trip is required. DEVINE

RRA 353 Camp Administration. *3(2-2) S.* Development of organized camping emphasis on the administration of resident camping programs. Educational and recreational objectives of camping. Program planning, leadership training, and administration of camps. Laboratory provides for application of camping principles. WARREN

RRA 358 The Recreation Program. *Preq: RRA 152. 4(2-4) F.* Theoretical and applied approaches to the recreation program planning process. Basic elements of programming using a variety of recreational settings and diversity of practical experience.
HARPER, LOVE, WILSON

RRA 359 Leadership and Supervision in Recreation. *Preqs: RRA 215, RRA 216. 3(2-2) S.* Development of awareness skills in leadership, group dynamics, human relations and employee supervision in the delivery of recreation services. HARPER, KIRSCH

RRA 365 Arts Management in Recreation. *Preq: Junior standing. 3(2-2) F.* Introduction to arts management in recreation programs; emphasis on the importance and benefits of arts to the individual and community. Understanding and appreciation of the role of the arts in a comprehensive recreation program plan. Emphasis on arts management principles including philosophy, fiscal, technical and physical community resources.
KIRSCH, WILSON

RRA 366 Administration of Recreation Sports. *Preq: RRA 358. 3(3-0) S.* General concepts and desirable practices for the effective management of community recreation sports programs. Techniques required for the identification and solution of problems usually associated with community sports programs. LOVE, REA

RRA 420 Resort Management and Operations. *Preq: RRA 152. 3(3-0) every third semester.* Theory and practical applications of planning, accommodations management, food and beverage operations, recreation programs, and management in the resort industry. BROTHERS, GUSTKE

RRA 438 Recreation for Special Populations. *Preq: RRA 358. 3(3-0) F.* Leisure concerns of deprived groups. Status, problems and community service needs of special populations found in most American communities. Special populations include the physically disabled, the mentally retarded, the aging and the economically deprived.
STERNLOFF

RRA 442 Recreation and Park Interpretive Services. *Preq: Junior standing. 3(2-3) F.* The principles and practices of environmental and historical interpretation. Personal (attended) and non-personal (unattended) interpretive communication techniques. Comprehensive planning and implementation of interpretive programs, and equipment and facilities used in environmental and historical interpretation. One overnight field trip required. WILSON

RRA 443 Applied Recreation and Park Interpretive Services. *Preqs: RRA 442, Junior standing. 3(1-6) S.* Development, implementation and evaluation of interpretive communication techniques as applied to historic and natural resources. WILSON

RRA 451 Principles of Recreation Planning and Facility Development. *Preq: RRA 358. 3(2-3) S.* Planning activities analyzed as decision making processes. Identification, interpretation, evaluation and utilization of data and resources necessary for recreation planning. Planning principles applied in the analysis of proposed and existing recreation sites. REA

RRA 453 Administrative Provesses of Recreation/Park Organizations. *Preq: RRA 359. 3(3-0) F.* Basic administrative processes; the internal organization of the recreation/park department; board and executive relationships; legal foundations and legal liability considerations; personnel practices and policies; and public relations administration. HARPER

RRA 454 Recreation and Park Finance. *Preqs: Six hours RRA, sr. standing. 3(3-0) S.* Recreation and park fiscal administration; sources of finance for operating and capital expenditures, revenue activities, financial planning, budgeting, expenditure policies, auditing and planning for recreation and park services. HARPER, KIRSCH

RRA 475 Recreation and Park Internship. *Preqs: RRA 358, RRA 359 and senior standing. 8(0-27) F,S,Sum.* Provides prospective park, recreation and leisure service professionals a 400 hour (ten week) learning experience in a selected agency or organization, under the joint supervision of a qualified manager and a university internship supervisor.

RRA 476 Post-Internship Seminar. *Preq: RRA 475. 1(0-2) F.* Identification and analysis of current management practices, challenges and issues common to leisure delivery systems.

RRA 480 Recreation Analysis and Evaluation. *Preqs: ST 311, RRA 359. 3(2-2) F,S.* Examination of the steps involved in analyzing and estimating the impact of recreation and parks services. Includes relevant issues and useful approaches for systematic analysis. Emphasis is placed on an understanding and development of various types of systematic evaluation designs. Activities leading to the analysis and development of performance reports to assess and improve managerial operational efficiency are covered.

SIDERELIS

RRA 491 Special Topics in Recreation. *Preq: Consent of department. 1-3 F,S,Sum.* Investigation and analysis of a problem associated with recreation resources.

Selected 500-Level Courses Open To Advanced Undergraduates

RRA 500 Theories of Leisure and Recreation. *Preq: Nine hours of RRA courses. 3(3-0) F.*

RRA 501 Research Methods in Recreation. *Preqs: ST 311 and nine hours of RRA courses. 3(3-0) S.*

RRA (EB) 503 Economics of Recreation. *Preq: EB 301 or 401. 3(3-0) F.*

RRA 504 Recreation and Park Data Systems. *Preqs: CSC 200, ST 311; Coreq: RRA 453. 3(3-0) F.*

RRA 505 Quantitative Techniques for Recreation and Natural Resource Management. *Preqs: CSC 200, ST 311. 3(3-0) S.*

RRA 510 Theories of Sport and Fitness Program Management. *Preq: RRA 358. 3(3-0) F. every third semester.*

RRA 511 Foundations for Sport, Exercise and Fitness Program Management. *Preq: RRA 358. 3(3-0) Every third semester.*

RRA 512 Recreational Sports Management. *Preq: RRA 358. 3(3-0) Every third sem.*

RRA 591 Recreation Resources Problems. *Preq: Advanced undergrad. or grad. status. 1-4 F,S.*

SOCIOLOGY

(Also see ANT—Anthropology; SW—Social Work.)

SOC 202 Principles of Sociology. *3(3-0) F,S,Sum.* Introduction to sociology. Analyses of key processes and institutions including interaction, inequality, organization, socialization, and social change. Includes core sociological concepts, methods, theories.

SOC 203 Current Social Problems. *3(3-0) F,S,Sum.* Definition and substance of social problems with emphasis on contemporary United States. Problems may include crime, race conflict, illness, family stress, inequality, poverty, housing, population, and social aspects of environmental crisis. Includes core sociological concepts, methods, theories.

SOC 204 Sociology of Family. *3(3-0) F,S,Sum.* Contemporary American family structures and processes and their development. Focus on socialization, mate selection, marital adjustment and dissolution. Includes core sociological concepts, methods, theories.

SOC 205 Work: Occupations and Professions. *3(3-0) F,S,Sum.* Focuses on worker experience of rewards, satisfaction, exploitation, and alienation. Examines occupations and work settings of industrial workers, professional workers, office workers, and executive workers. Recurrent themes include effects of technology and managerial control on worker experiences, changing job opportunities for women, and relationship of education to jobs. Includes core sociological concepts, methods, theories.

SOC 206 Social Deviance. *3(3-0) F,S,Sum.* Social processes in the creation and maintenance of deviant populations: classification, objectification of social meanings, functions of subcultures, and social outcomes of the deviance-ascription process. Includes core sociological concepts, methods, theories.

SOC 220 Cultural Geography. *3(3-0).* Investigates the world's past and present cultural diversity by studying spatial patterns of population, language, religion, material and non-material culture, technology and livelihoods, communities and settlements, and political organization and interaction.

SOC 241 Sociology of Agriculture and Rural Society. *3(3-0) F,S.* Application of sociological concepts, methods, theories and styles of reasoning to major social problems facing rural America. Changing structure of agriculture; social impact of agricultural technology; rural community growth and decline; rural industrialization; rural poverty; natural resources and environmental issues in rural America. Includes core sociological concepts, methods, theories.

SOC (ANT) 261 Technology in Society and Culture. *3(3-0) F,S.* Processes of social and cultural change with focus on role of technological innovation. Cross-cultural emphasis. Special attention to role of scientists and engineers in socio-cultural change. Social and cultural impact analysis of planned technological change. Topical case studies apply course concepts and principles. Includes core sociological concepts, methods, theories.

SOC 281 Sociology of Medicine (Formerly SOC 313). *3(3-0) F,S.* Employs theory and empirical studies to understand the social etiology of disease health practices, practitioners, and institutions, and the special area of mental health. Studies historical as well as contemporary examples of social influences on, and effects of, health throughout the world, but especially in the United States. Includes core sociological concepts, methods, theories.

SOC 300 Social Research Methods. *Preq: 3 cr. in SOC, 200 level; Coreq: ST 311. 4(3-2). F,S,Sum.* Basic methods of social research, research design, sampling, data collection, measurement, and analysis; the relationship between theory and research. Laboratory exercises on computer applications.

SOC 301 Human Behavior. *Preq: 3 cr. in SOC, 200 level. 3(3-0) F,S,Sum.* The development of personality as a consequence of social interactions and behavior of individuals in social contexts. Topics include processes of learning, socialization, social perception, organization, stability and change of attitudes, norms, norm-formation and conformity, social roles and role strain, interpersonal attraction, and intergroup and intragroup relations.

SOC 302 Mass Communications and Modern Society. *Preq: 3 cr. in SOC, 200 level 3(3-0).* Sociology of mass communications: its processes, messages, audiences, communicators, and social effects. Classic works by social scientists studied for impact of mass communications on contemporary decision-making and life style.

SOC 304 Women and Men in Society. *Preq: 3 cr. in SOC, 200 level. 3(3-0).* Investigates perpetuation and change in female and male gender roles using sociological concepts, theories and research. Explores how gender role expectations are developed and transmitted. Employs historical and cross-cultural perspectives as comparative bases for studying causes and consequences of sex differentiation in contemporary society.

SOC 305 Racial and Ethnic Relations. *Preq: 3 cr. in SOC, 200 level. 3(3-0) F,S,Sum.* Study of the nature of the relationships among racial and ethnic groups in societies around the world but with emphasis on the United States. Explores topics such as inequalities of wealth, power, and status, racism, conflict, and social boundaries among groups. Current trends in intergroup relations are discussed.

SOC 306 Criminology. *Preq: 3 cr. in SOC, 200 level. 3(3-0) F,S,Sum.* The processes whereby behavior is defined as crime and persons are identified as criminals. Includes a sociological investigation of agencies of law enforcement, adjudication, correlations, and prevention; patterns of criminal behavior; explanations of variations in criminality with emphasis on sociocultural and sociopsychological theories.

SOC (REL) 309 Religion and Society. *3(3-0).* Religious beliefs, practices, and organizations addressed as social phenomena. Structural functionalism, conflict, and subjectivism as theoretical orientations for understanding influences between religion and society. Relationship of religions to family, government, and economy, and to social divisions, conflict, and change.

SOC 311 Community Relationships. *Preq: 3 cr. in SOC, 200 level. 3(3-0)* Institutions, organizations, and agencies found in modern communities; social problems and conditions with which they deal; their interrelationships and trends toward comprehensive planning.

SOC 342 Rural Societies Around the World. *Preq: 3 cr. in SOC, 200 level. 3(3-0) S.* Sociological description, analysis and understanding of rural societies in Asia, Africa and Latin America and an overview of the process of socioeconomic development in these societies. Specific topics include sociological approaches to the study of development, land tenure, agrarian reform, the social and economic structures of peasant societies, and peasant revolt and revolution.

SOC 351 Population and Planning. *Preq: 3 cr. in SOC. 3(3-0) F.* Effects of births, deaths and migration on population size, composition, and distribution. Socioeconomic and political implications of demographic change. Impact of alternative policies on demographic processes.

SOC 400 Theories of Social Structure. *Preq: 3 cr. in SOC, 200 level. 3(3-0) F,S.* Contributions of Durkheim, Marx, Weber and others to contemporary macro-level sociological theories. Origins and development of functionalist and conflict approaches. Theories of social solidarity, class structure, the state, bureaucratization, ideology. Uses of original works.

SOC 401 Theories of Social Interaction. *Preq: 3 cr. in SOC, 200 level. 3(3-0) F,S.* Contributions of Weber, Simmel, Mead, Homans and others to contemporary micro-level sociological theories. Origins and development of ethnomethodology, symbolic interaction and exchange theory. Theories of the self, social construction of reality, interpersonal conflict. Uses of original works.

SOC 402 Urban Sociology. *Preq: 3 cr. in SOC, 200 level; SOC 300 or equivalent methods course. 3(3-0).* Urban social structures emphasizing determinants and consequences of changes in urban places and life styles. Current urban problems and various approaches to urban social planning.

SOC 410 Sociology of Organizations. *Preq: 3 cr. in SOC, 200 level; SOC 300 or equivalent methods course. 3(3-0).* Applications of sociological theories to study of organizational structures and processes. Special attention to formal and informal controls, structural change, conflict and cooperation, and organizational relations with environment. Extensive use of case studies and historical investigations.

SOC (PS) 413 Criminal Justice Field Work. *Preqs: SOC 306 and PS 311; senior standing in Criminal Justice option. 4(2-8) F,S.* Supervised observation and experience in a criminal justice agency. Study of relationships between ongoing programs and relevant political and sociological theory and research. Weekly seminars, small groups, and individual conferences. Presentation of an integrative report.

SOC 414 Social Class. *Preq: 3 cr. in SOC, 200 level; SOC 300 or equivalent methods course. 3(3-0).* The universality of social inequality, its bases, and consequences. Relationship of social inequality to social class, life chances, life styles and social mobility. Theories and research methods pertinent to the study of social class.

SOC 415 Social Thought. *Preq: 3 cr. in SOC, 200 level; SOC 300 or equivalent methods course. 3(3-0).* Discussion and analysis of social thought in its philosophical and social science, especially sociological, perspectives. Major sociological theories, their construction and evaluation, their application to specific substantive fields, and the relationship between theory and research.

SOC 418 Sociology of Education. *Preq: 3 cr. in SOC, 200 level; SOC 300 or equivalent methods course. 3(3-0).* Application of sociological theories to education, relating processes of stratification, socialization, and organization. Sociological analysis of classroom and learning. Connections of schooling with family, community, and work. Cross-cultural and U.S. research.

SOC 420 Sociology of Corrections. *Preqs: 3 cr. in SOC, 200 level; SOC 300 or equivalent methods course. 3(3-0) S.* A variety of correctional settings studied in sociological perspective. Major topics: formal and informal organization; inmate social systems; correctional programs and their consequences; alternatives to confinement; special-purpose facilities. Focus on contemporary American prison systems with historical and cross-cultural comparisons.

SOC 425 Juvenile Delinquency. *Preq: 3 cr. in SOC, 200 level; SOC 300 or equivalent methods course. 3(3-0) S,Sum.* Nature and extent of juvenile delinquency; measurement problems; and biogenic, psychogenic and sociogenic theories of delinquency causation. Policy implications of delinquency theories for treatment and prevention. Evaluation of treatment and prevention programs.

SOC 426 The Juvenile Justice System. *Preq: 3 cr. in SOC, 200 level; SOC 300 or equivalent methods course. 3(3-0) F.* The development of the juvenile justice system; theory and practice of juvenile justice with emphasis on social control, social organization and social interaction; decision making and its consequences as demonstrated in enforcement, adjudication and corrections. Field trips to various juvenile justice agencies.

SOC 427 Sociology of Law. *Preq: 3 cr. in SOC, 200 level; SOC 300 or equivalent methods course. 3(3-0) F.* Sociological concepts, theories, and research of law as social control. Social forces behind the creation, maintenance, and application of law in American Society.

SOC 440 Social Change. *Preq: 3 cr. in SOC, 200 level; SOC 300 or equivalent methods course. 3(3-0).* Sources, processes, and consequences of social change on macro and micro levels. Applications of classical and contemporary theories to historical and modern examples of social change in international, national, regional, community, and institutional settings. Examples of empirical studies and appropriate methodologies for each level of analysis.

SOC 485 Independent Field Work in Applied Sociology. *Preq: SOC 300; Coreq: SOC 410. Senior standing in Sociology. 3-6 F,S,Sum.* Supervised observation and experience in an applied setting. Student develops and demonstrates competency in his/her major area by applying sociological knowledge to organization/agency problems.

SOC 490 Senior Seminar in Sociology. *Preqs: Senior standing and consent of department; SOC 300 or equivalent. 3(3-0).* Synthesis of knowledge, theory, and methods from earlier courses or a detailed study of a substantive or conceptual area.

SOC 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

SOC 493 Special Problems in Sociology. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Arrangements must be initiated by student and approved by a faculty advisor and departmental teaching coordinator.

SOC 495 Special Topics in Sociology. *1-3 F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for new courses on a trial basis.

SOC 498 Independent Study in Sociology. *Preq: Six hours SOC above the 200 level. 1-6 F,S,Sum.* A detailed investigation of a topic in sociology. Topic and mode of study determined by the faculty member(s) in consultation with the department head.

Selected 500-Level Courses Open To Advanced Undergraduates

SOC 501 Leadership. *Preq: SOC 202 or equivalent. 3(3-0).*

SOC 502 Society, Culture and Personality. *Preq: SOC 202 or equivalent. 3(3-0).*

SOC 505 Medical Sociology. *Preq: Six credits in SOC or grad. standing or PBS status. 3(3-0).*

SOC 508 Social Organization. *Preq: SOC 400 or SOC 511. 3(3-0).*

SOC 509 Population Problems. *Preq: SOC 202 or equivalent. 3(3-0).*

SOC 510 Industrial Sociology. *Preq: SOC 202 or equivlent. 3(3-0).*

SOC 512 Survey of Family Sociology. *Preq: SOC 202 or equivalent. 3(3-0).*

SOC 513 Community Organization and Development. *Preq: SOC 202 or equivalent. 3(3-0).*

SOC 514 Developing Societies. *Preq: Six hours SOC or ANT or grad. standing or PBS status. 3(3-0).*

SOC 515 Deviant Behavior. *Preq: Six hours SOC or ANT or grad. standing or PBS status. 3(3-0).*

SOC 516 Social Control. *Preq: Six hours SOC above 200 level or grad. standing or PBS status. 3(3-0).*

SOC 520 Sociology of Religion. *Preq: SOC 202 or equivalent or grad. standing or PBS status. 3(3-0).*

SOC 523 Sociological Analysis of Agricultural Development. *Preq: Six hours SOC or grad. standing. 3(3-0).*

SOC 534 Sociology of U.S. Agriculture. *Preqs: Six hours SOC, or grad. standing. 3(3-0).*

SOC 541 Social Systems and Planned Change. *Preq: Three hours SOC. 3(3-0).*

SOC 555 Social Stratification. *Preq: Six hours SOC. 3(3-0).*

SOC (EB) 574 The Economics of Population. *Preq: EB 301 or 401. 3(3-0) S.*

SOC 590 Applied Research. *Preq: SOC 202 or equivalent. 3(3-0).*

SOC 591 Special Topics in Sociology. *Preq: CI. 1-6.*

SPEECH-COMMUNICATION

(See COM—Communication)

SOIL SCIENCE

SSC 200 Soil Science. *Preqs: One semester of chemistry. 4(3-3) F,S.* Fundamentals of soils including origin, composition and classification; their physical, chemical, and biological properties; significance of these properties to soil-plant relationships and soil management. KLEISS

SSC (BAE) 323 Water Management. *Preq: Junior standing. 3(2-2) F.* Water management principles applied to agriculture; hydrologic cycle, runoff, surface and sub-surface drainage, soil conservation measures to reduce erosion and sedimentation, irrigation, pond construction, open channel flow, water rights and environmental laws pertaining to water management. Emphasis on problem solving. SNEED

SSC (BAE) 324 Elementary Surveying. *Preq: Junior standing. 1(0-3) F.* Theory and practice of plane surveying to include measuring distances as well as record keeping, differential leveling, profile leveling, topographic mapping, stadia surveying, and the use of these tools in agricultural applications.

SSC 341 Soil Fertility and Fertilizers. *Preqs: SSC 200, BS 100. 3(3-0) F.* Principles of managing plant nutrition for crop production; fertilizer materials, crop fertilization, soil fertility maintenance, and management practices for optimizing fertilizer use; soil and plant tissue testing as diagnostic tools in nutrient management. MINER

SSC 342 Soil Fertility Laboratory. *Coreq: SSC 341. 1(0-3) F.* Growing plants in solution and soil. Relating nutrient requirements to soil test data determined in lab. Calculating quantities of lime and fertilizer needed and computing least cost blends. Field trips for soil sampling and visiting soil testing lab and bulk blending plants. COX

SSC 361 Non-Agricultural Land Use and Management. *Preq: SSC 200. 3(2-3) S. Alt. yrs.* History of land use; competition among uses of land for food and fiber production, living space, and open space; engineering properties; land treatment of wastes; erosion and sedimentation control; land use in coastal areas; development of land use plan. KING

SSC (PM) 370 Alternative Agricultural Systems. *Preq: SSC 200. 3(3-0) S. Alt. yrs.* Principles and methodologies of alternative agricultural systems (e.g. organic, biodynamic, biological, ecological, permaculture) as related to soil productivity and management, nutrient sources, energy, economics, pest management, pollution and current research. Explore the feasibility of alternative systems or combinations of alternative and conventional systems as viable methods for food and fiber production. KING

SSC 452 Soil Classification. *Preq: SSC 200. 4(2-5) S.* Genesis, morphology, and classification of soils; characterization of soils according to their diagnostic properties; interpreting soil use potential; emphasis on North Carolina soils and their taxonomy; field exercise in soil mapping and site evaluation; several field trips, one overnight. KLEISS

SSC 461 Soil Physical Properties and Plant Growth. *Preq: SSC 200 or equivalent. 3(3-0) F.* Soil physical properties and their influence upon plant growth; soil solid-porosity relationships, soil water, soil temperature, soil aeration and mechanical impedance. Principles associated with management and alteration of physical properties. CASSEL

SSC (CS) 462 Soil-Crop Management Systems. *Preqs: CS 212, CS 414, SSC 342, SSC 452; senior standing. 3(2-3) S.* Unites principles of soil science and crop science with those of allied areas into realistic agronomic applications; practical studies in planning and evaluation of soil and crop management systems. FIKE, WAGGER

SSC 472 Forest Soils. *Preq: SSC 341, or FOR 303. 3(2-3) S.* Soil as a medium for tree growth; relation of soil physical, chemical, and biological factors to the practice of silviculture; extensive soil management in the forest and intensive soil management in forest nurseries and in seed orchards; relation of soil and site to forest genetics, ecology, pathology, and entomology. DAVEY

SSC 491 Senior Seminar in Soil Science. *Preq: Senior standing. 1(1-0) S.* Development of skills for future professionals including resume preparation, interviewing, and the preparation and delivery of oral presentations. KLEISS

SSC 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with the prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

SSC 493 Special Problems in Soil Science. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within a framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

SSC 495 Special Topics in Soil Science. *Preq: SSC 200. 1-6 F, S.* Special topics, problems, trial courses, or activities in various phases of soil science. KLEISS

Selected 500-Level Courses Open To Advanced Undergraduates

SSC 501 Tropical Soils: Characteristics and Management. *Preq: Six credits in SSC. 3(3-0) S. Alt. yrs.*

SSC 511 Soil Physics. *Preqs: SSC 200, PY 212. 4(3-3) F.*

SSC 520 Soil and Plant Analysis. *Preqs: PY 212; CH 315; at least three soils courses including SSC 341 or CI. 3(2-3) Alt. S.*

SSC 522 Soil Chemistry. *Preqs: SSC 200, one year of general inorganic chemistry. 3(3-0) S.*

SSC 532 Soil Microbiology. *Preqs: MB 401; CH 220 or CI. 4(3-3) S.*

SSC 541 Soil Fertility. *Preq: SSC 341. 3(3-0) F.*

SSC 551 Soil Morphology, Genesis and Classification. *Preqs: MEA 120, SSC 200, SSC 341. 3(3-0) F.*

SSC 553 Soil Mineralogy. *Preqs: SSC 200, SSC 341, MEA 330. 3(2-3) F.*

SSC 590 Special Problems. *Preq: SSC 200. Credit Arranged. F,S.*

STATISTICS

ST 100 Perspective on Statistics. *For Statistics majors only. 1(1-0) F.* Orientation to statistics including historical background, statistics as a problem solving approach and careers in statistics. Introduction to use of computer as problem solving tool.
STINES, WASIK

ST 101 Statistics by Example. *Preq: Credit not allowed if student has prior credit for another ST course. 3(3-0) F.* Introduces a broad range of statistical topics by the use of real life examples drawn from the social, physical and life sciences, the humanities, and sports. Tables and graphs, elementary probability, frequency distributions, estimation, hypothesis testing, sampling, prediction, modeling. DIETZ

ST (PSY) 240 Introduction to Behavioral Research I. *Preq: PSY 200; Coreq: PSY (ST) 241. For PSY and HRD majors only. 3(3-0) F,S.* (See Psychology).

ST (PSY) 241 Introduction to Behavioral Research I Lab. *Preq: PSY 200; Coreq: PSY (ST) 240. For PSY and HRD majors only. 1(0-2) F,S.* (See Psychology).

ST (PSY) 242 Introduction to Behavioral Research II. *Preq: PSY (ST) 240; Coreq: PSY (ST) 243. For PSY and HRD majors only. 3(3-0) F,S.* (See Psychology).

ST (PSY) 243 Introduction to Behavioral Research II Lab. *Preq: PSY (ST) 240; Coreq: PSY (ST) 242. For PSY and HRD majors only. 2(0-4) F,S.* (See Psychology).

ST 301 Statistical Methods I. *Preqs: MA 102; CSC 101 or CSC 111. 3(3-0) F.* An introduction to the principles and practices of collecting and analyzing data. Techniques for drawing appropriate samples; summarizing data; estimating means, variances, regression coefficients, and correlations; measures of association; and tests of hypotheses. The use of computer and statistical packages for data storage, retrieval and simple analyses.

ST 302 Statistical Methods II. *Preq: ST 301. 3(3-0) S.* Methods and practices of applied statistics, including multiple and non-linear regression, analysis of variance and multivariate analysis. The use of statistical packages on the computer will be emphasized. Exercises aimed at developing mastery of matrix manipulating packages as tools to obtain desired analyses will be included.

ST 311 Introduction to Statistics. *Preq: Credit not allowed if student has prior credit for another ST course or EB 350. 3(3-0) F,S,Sum.* Quantitative descriptions of populations; sampling ideas in experiments and surveys; making inferences from samples; measuring and coping with uncertainties inherent in statistical inference. POLLOCK

ST (EB) 350 Economics and Business Statistics. *Preqs: MA 114; EB 201 or 212. 3(3-0) F,S,Sum.* (See Economics and Business.)

ST 361 Introduction to Statistics for Engineers. *Preq: College algebra. 3(3-0) F,S,Sum.* Statistical techniques useful to engineers and physical scientists. Includes elementary probability, frequency distributions, sampling variation, estimation of means and standard deviations, confidence intervals, significance tests, elementary least squares curve fitting.

ST 371 Introduction to Probability and Distribution Theory. *Preq: MA 201; Coreq: MA 202. 3(3-0) F,S,Sum.* Basic concepts of probability and distribution theory for students in the physical sciences, computer science and engineering. Provides the background necessary to begin study of statistical estimation, inference, regression analysis, and analysis of variance.

ST 372 Introduction to Statistical Inference and Regression. *Preq: ST 371. 3(3-0) F,S,Sum.* Statistical inference and regression analysis including theory and applications. Point and interval estimation of population parameters. Hypothesis testing including use of t, x^2 and F. Simple linear regression and correlation. Introduction to multiple regression and one-way analysis of variance.

ST 421 Introduction to Mathematical Statistics I. *Preq: MA 202 or 212. 3(3-0) F.* Elementary mathematical statistics primarily for undergraduate majors and graduate minors in Statistics. Introduction to probability, common theoretical distributions, moments, moment generating functions, sampling distributions, central limit theorem.

ST 422 Introduction to Mathematical Statistics II. *Preq: ST 421. 3(3-0) S.* Elementary mathematical statistics primarily for undergraduate majors and graduate minors in Statistics. Point and interval estimation, maximum likelihood, tests of hypotheses, concepts of decision theory and elements of general linear model theory.

ST 430 Introduction to Regression Analysis. *Preq: ST 302. 3(3-0) F.* Regression analysis as a flexible statistical problem solving methodology. Matrix review; variable selection; prediction; multicolinearity; model diagnostics; dummy variables; logistic and non-linear regression. Emphasizes use of computer.

ST 431 Introduction to Experimental Design. *Preq: ST 302. 3(3-0) S.* Experimental design as a method for organizing analysis procedures. Completely randomized, randomized block, factorial, nested, latin squares, split-plot, and incomplete designs. Response surface and covariance adjustment procedures. Stresses use of computer.

GIESBRECHT, WASIK

ST 432 Introduction to Survey Sampling. *Preq: ST 302. 3(3-0) S.* Design principles pertaining to planning and execution of a sample survey. Simple random, stratified random, systematic, and one- and two-stage cluster sampling designs. Emphasis on statistical considerations in analysis of sample survey data. Class project on design and execution of an actual sample survey.

ST 435 Statistical Methods for Quality and Productivity Improvement. *Preq: ST 302. 3(3-0) F.* Use of statistics for quality control and productivity improvement. Control chart calculations and graphing; process control and specification; sampling plans; and reliability. Computer use will be stressed for performing calculations and graphing. WASIK

ST 445 Introduction to Statistical Computing and Data Management. *Preq: ST 302. 3(3-0) S.* Introduction to use of computers to manage, process and analyze data. Topics include concepts of research; data management; JCL and utility programs; use of statistical program package for data analyses and graph production; and writing statistical programs to perform simulation experiments. Students will make reports on class projects.

WASIK

ST 493 Special Topics in Statistics. *Preq: Consent of department. 1-3 F,S,Sum.* In depth exploration of advanced areas and topics not covered in present statistics courses. Topics and mode of study determined by faculty member.

Selected 500-Level Courses Open To Advanced Undergraduates

ST 505 Applied Nonparametric Statistics. *Preq: ST 372 or ST 511. 3(3-0) S.*

ST (ZO) 506 Sampling Animal Populations. *Preq: ST 512. 3(3-0) F. Alt. yrs.*

ST 507 Statistics for the Behavioral Sciences I. *3(3-0) F.*

ST 508 Statistics for the Behavioral Sciences II. *Preq: ST 507 or CI. 3(3-0) S.*

ST 511 Experimental Statistics for Biological Sciences I. *Preq: ST 311 or grad. standing. 3(3-0) F,S.*

ST 512 Experimental Statistics for Biological Sciences II. *Preq: ST 511 or equivalent. 3(3-0) F,S.*

ST 514 Experimental Statistics for Social Sciences II. *Preq: ST 507 or equivalent. 3(3-0) S.*

ST 515, 516 Experimental Statistics for Engineers. *Preq: (515) ST 361 or grad. standing; (516) ST 515 or equivalent. 3(3-0) F,S.*

ST 517 Applied Least Squares. *Preq: ST 430 or equivalent. 3(3-0) F.*

ST 518 Applied Time Series Analysis. *Preq: ST 512. 3(3-0) F.*

ST 519 Applied Multivariate Statistical Analysis. *Preq: ST 512 or equivalent. 3(3-0) S.*

ST 521 Statistical Theory I. *Coreqs: MA 425 or MA 511 and MA 305. 3(2-2) F.*

ST 522 Statistical Theory II. *Preq: ST 521; Coreq: MA 426 or MA 512. 3(2-2) S.*

ST 531 Design of Experiments. *Preq: ST 431 or equivalent. 3(3-0) F.*

ST 535 Statistical Quality Control. *Preq: ST 515. 3(3-0) F.*

ST (MA) 541 Theory of Probability I. *Preq: MA 425 or 511. 3(3-0) F.*

ST (MA) 542 Introduction to Stochastic Processes. *Preqs: MA 305 and ST 541 or ST 521. 3(3-0) S.*

ST (TOX) 563 Statistical Problems in Toxicology. *Preq: ST 511 or equivalent. 2(2-0) S. Alt. yrs.*

ST (BMA, MA) 571 Biomathematics I. *Preq: Advanced calculus, reasonable background in biology or CI. 3(3-0) F.*

ST (OR, BAMA) 575 Decision Analytic Modeling. *Preq: MA 421 or ST 421 plus ST 511 or ST 516. 4(3-2). Alt yrs.*

ST 591 Special Problems. *Preq: CI. 1-3 F,S,Sum.*

SOCIAL WORK

(Also see SOC—Sociology; ANT—Anthropology.)

SW 201 Community Social Services. *3(3-0) F.* Study of social services typical of American communities including services to children, families, and older persons; and services in mental health, criminal and juvenile justice, and industry. Volunteer work required.

SW 203 The Development of Social Welfare in the U.S.: Policy and Programs I. *3(3-0) F,S.* Major programs and policy developments in U.S. social welfare from the colonial period through the depression of the 1930's. Emphasis is upon definition of social problems and the characteristics of social programs.

SW 205 Social Welfare in Contemporary America: Policy and Programs II. *Preq: SW 203. 3(3-0) F,S.* Social welfare policy and programs from the 1930's to the present. Social security, employment programs, public assistance, the War on Poverty, reform efforts of the 1970's and developments in the 1980's.

SW 307 Economic Security Programs. *Preq: SW 205. 3(3-0) S.* Major economic security programs and their impact on the populations they serve. Analysis and evaluation of the benefit structure of social insurance and public assistance programs and proposals and attempts to reform these programs.

SW 309 Social Work in Schools. *Preq: Social work students. 3(3-0) F,Sum.* Practice models and roles relevant to school social work. Emphasis on cooperative work with school personnel in the identification, prevention and treatment of social, emotional and behavioral problems of children and interventive techniques with parents and community groups. Designed for individuals preparing for social work practice in the public schools and for school social workers toward recertification.

SW 310 Human Behavior Theory for Social Work Practice. *Sophomore standing. 3(3-0) F,S.* Theory regarding human social functioning for students intending to practice social work. Emphasis on social, biological, psychological, and cultural factors in human life.

SW 311 Black Family in its Social Environment. *Preq: Sophomore standing. 3(3-0).* Considers alternative conceptual models of Black family life and their relationships to other social institutions and to social policy development. Examines policy implications of Black family demographic characteristics, socialization patterns, gender roles, and kinship patterns. SMITH

SW 312 Social Work Practice in Health Care. *Social Work students. 3(3-0).* Practice skills and knowledge required of social workers in health care systems. Multi-disciplinary team work in health care. Social components of major illnesses and disabilities, including prevention and rehabilitation. Emotional, cultural, economic and social factors in health and illness. Health needs of specific population groups.

SW 314 Child Welfare. *Social Work students. 3(3-0).* Focuses on social work practice with children, youth, their parents and substitute parents. Emphasizes development of diagnostic and case planning activities which support, augment or substitute for the family. Includes methods of protective services which focus on the maintenance, improvement and/or restoration of the social functioning of parents and children.

SW 320 Social Work Practice I. *Preq: SW 310. 3(3-0) F, S.* Elements of the general method of social work practice: professional values, client-worker relationships, and professional roles. Interviewing skills and problem analysis.

SW 405 Social Work Practice II. *Preq: SW 320. 3(3-0) F,S.* Problem-solving in social work practice with individuals and groups, including family and community groups.

SW 406 Field Work in Social Services I. *Preq: SW 320; Coreq: SW 405. This course may be repeated only once. 6(2-16) F,S.* Supervised placement in a social service organization. Application of social work knowledge and skill. Weekly seminar on campus.

SW 407 Field Work in Social Services II. *Preq: SW 406. This course may be repeated only once. 6(2-16) F,S.* Advanced supervised work in social service organization. Weekly seminar on campus.

SW 420 The Legal Aspects of Social Work. *Preq: SW 307; Social Work students. 3(3-0) F,S.* Legal environment of the social work profession. Relationships among legal processes, the delivery of social work services, and client problems.

SW 498 Special Topics in Social Work. *Preq: Nine hours of Social Work. Social Work students. 1-6 F,S,Sum.* Independent or small group study of a social work practice or social welfare area.

TEXTILES

T 105 Introduction to Textile Material Science. *3(2-2) F,S.* Special properties of fibers and their classification, structures of yarns and fabrics, surface treatments of fabric, end products, market and management factors. Exercises and tutorial/problem sessions. A field trip will be required.

T 110 Textiles Scholars Forum. *Preq: Enrollment limited to participants in the Textiles Scholars Program. 0(2-0) F,S.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

T 200 Introduction to Textiles. *Not open to students required to take T 105. 3(3-0) S.* Survey of textiles including technical and economic history of the industry; physical and chemical processes involved in producing textile products from raw materials; unique aesthetic, physical and chemical properties of textiles and how these properties are determined by raw materials and production processes; and influence of properties of textile materials on their utilization and performance.

T 210 Textiles Scholars Forum. *Preq: Enrollment limited to participants in the Textiles Scholars Program. 0(2-0) F,S.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

T 401 Environmental Aspects of the Textile Industry. *Preq: Senior standing. 3(3-0) S.* Environmental pollution sources and effects, occupational safety and health, and typical problems specific to the textile industry. Survey of natural and synthetic fiber pollution problems with case histories. Techniques for pollution control by source reduction and treatment. Safety and health management for hazards in the industry.

T 402 Introduction to the Theory and Practice of Fiber Formation. *Preqs: Senior standing; TC 203, MA 231, PY 212, and either CH 103 or CH 107. 3(3-0) F.* Flow behavior of polymeric materials as related to the formation of fibers by melt, dry and wet extrusion. Elementary theories of drawing and heat setting. Application of fiber-forming theories to synthetic and callulosic fibers.

T 490 Development Projects in Textiles. *Preqs: Senior standing and 2.75 GPA. Course may be taken twice provided projects are different subject matter. 2-3 F,S,Sum.* Directed undergraduate research in textile engineering and science through experimental, theoretical and literature studies in textile and related problems.

T 491H Honors Seminar in Textiles. *By invitation into Honors Program in Textiles. 1(1-0) F,S.* A seminar on current university and industrial research in the field of textiles.

T 492 Special Topics in Textiles. *Preq: Senior standing. 1-3 F,S.* Special topics related to textile engineering and science.

T 493 Industrial Internship in Textiles. *Preq: Textile core courses. (Minimum GPA 2.0). Limited to three credits per student; 10 weeks of 40 hours required. 3 F,S,Sum.* Paid professional level work experience in textiles, relating academic training in science and technology to industrial practice under professional guidance. Written reports used for grading. Appropriate department head approval required.

T 495 Senior Seminar in Textiles. *Preqs: Senior standing and CI. Restricted to students in the College of Textiles. 1(1-0) F.* Topics of current interest and case studies in the textile and allied industries are presented by guest lecturers. Written reports and discussions required of students.

Selected 500-Level Courses Open To Advanced Undergraduates

T 500 Fiber and Polymer Microscopy. *Preqs: MA 231, PY 212, TC 203. 3(1-4) F.*

TEXTILE AND APPAREL MANAGEMENT

TAM (PD) 170 Textile Design Orientation. *1(0-2) S.* Orientation course designed to present the breadth and scope of the Textile Design profession together with future opportunities in this field.

TAM 215 Introduction to Apparel Technology. *Preq: T 200 or College of Textiles sophomore. 3(3-0) S.* Study of selection of raw materials and manufacturing processes for producing acceptable mass-produced apparel products. Emphasis also placed on design and assembly methods to provide functionality, quality, and fit. Planned field trips as available.

TAM 216 Introduction to Apparel Pattern Generation. *Sophomore or higher standing. 3(2-2) F.* Introduction to various methods of generating patterns for mass-produced apparel with emphasis on "flat pattern" design techniques. Relationship of body configuration to pattern shape, specifications to garment size and fit, standards for judging fit, distinctions between ease and style fullness, and design analysis procedures are included.

TAM (DN) 272 Printed Textile Design. *Preq: A grade of C or better in DF 101 or DF 111. 3(0-6) S.* Design and production of printed and pattern-dyed fabrics. Development of design abilities through hand production methods with an awareness of industrial processes.

TAM 315 Apparel Production I. *Preq: TAM 215. 3(2-2) F.* Concepts and practices for the production of basic apparel items, beginning with selection of fabric and other raw material garment components and extending through pattern development, pattern grading, and pattern engineering. Techniques for development of styled patterns and for solution of problems of fit.

TAM 316 Apparel Production II. *Preq: TAM 315. 3(2-2) S.* Principles of apparel manufacturing: markers (stencils and computer); spreading and cutting technology; and seaming, stitching, and joining for industrial sewing machines and ultrasonic machines; pressing.

TAM (TT) 330 Textile Measurements and Quality Control. *Preqs: TS 211, TT 220, TT 250, ST 361. 4(3-2) F,S.* Principles of measuring basic physical properties of textile materials; techniques of in-process control and evaluation of product quality; application to the manufacturing sequence of statistical control charts and capability limits; aspects of sampling theory. BANKS-LEE

TAM 331 Quality Control for Textile Production Management. *Preqs: TS 211, TT 220, TT 250, ST 361. Not for students who take TAM (TT) 330. 3(2-2) F,S.* Principles of quality control applied by management to the production process; techniques of decision making relative to product quality and profits; attitudes and responsibilities for quality; systems for quality assurance. SUH

TAM (PD) 371 Woven Textile Design. *Preq: T 105. 3(1-4) F.* Design and production of woven fabrics, including an exploration of various basic structures, color effects and textural effects. Development of design abilities through hand production methods with an awareness of industrial processes. G. SMITH

TAM (PD) 372 Knitted Textile Design. *Preq: T 105. 3(1-4) S.* Design and production of both hand- and machine-knitted fabrics, jacquard patterning, and color effects. Development of design abilities through practical application of hand- and machine-production methods. Awareness of industrial processes. DONALDSON

TAM 380 Management and Control of Textile Systems. *Preqs: EB 201, TT 220, TT 250, or jr. standing in textile engineering. 3(3-0) F,S.* Management approaches and practices and basic economic considerations in the development, production, and distribution of industrial and consumer textile and apparel products.

TAM 381 Supervision in the Textile and Apparel Industries. *Preqs: TAM 380, PSY 200. 3(3-0) S.* Supervision applied to the specific problems confronting the textile and apparel industries. Role of supervisors in maintaining productivity in an atmosphere wherein continuing and critical problems prevail. Emphasis on supervisors competencies needed to effectively discharge their responsibilities. ROBINSON

TAM 382 Principles of Soft Goods Marketing. *Preq: EB 201. Credit not allowed for both TAM 382 and EB 313. 3(3-0) F.* Principles of marketing textiles in the consumer goods sector. Emphasis on market segmentation, product strategy, pricing decisions, promotion

and channels of distribution. Interface between textile manufacturers and those producing apparel and upholstered furniture. Marketing channel for apparel to the retailer.
BERKSTRESSER

TAM 383 Management Aspects of Textile Product Development. *Preqs: TS 211, TT 220, TT 250, TC 301. 3(3-0) S.* Development of products in order to meet profit goals. Integrates technology skills with management skills in problem solving.
BERKSTRESSER, GILMORE, LITTLE

TAM 431 Fabric Performance Testing. *Preqs: TAM (TT) 330, senior standing. 3(2-2) F.* Special and advanced techniques for measuring selected physical and aesthetic properties of natural and man-made textile materials; application of the physical law to technique and instrumentation; interrelation of the material, method of test, instrumentation involved and the resulting physical measure. GHOSH

TAM (PD) 470 Textile Design Studio. *Preq: A grade of C or better in TAM (DN) 272, 371, and 372. 6(0-9) F.* Semester design project based on a single problem statement. Individual investigation of resources, processes and solutions in the development of a collection of fabrics or end products. Public exhibition of collections. DONALDSON

TAM 480 Textile Production and Cost Control. *Preqs: TAM 380, EB 301, ACC 280 or 210, senior standing. 3(3-0) F,S.* Fundamental concepts in textile production and operations management as well as analytical techniques and controls necessary for decision-making and management in a textile environment. BERKSTRESSER, HODGE, POWELL

TAM (EB) 482 Textile Marketing Management. *Preqs: EB 313, EB 301, TAM 380. 3(2-2) F,S.* The development and state of the art of current textile marketing management theory and practice are covered in classroom sessions. Management lab sessions include experiential, marketing games, and role-playing exercises. Current industry practice and government relations are stressed. BERKSTRESSER

TAM 484 Management Decision Making for the Textile Firm. *Preqs: TAM 480, EB 302; Coreq: TAM (EB) 482. 3(3-0) F,S.* The economic, institutional and environmental setting within which the textile firm makes management decisions, including in-depth analyses of specific issues and problem areas as they affect the textile industry. Special emphasis will be given to topics of current interest and significance. BERKSTRESSER

TAM 487 Textile and Apparel Labor Management. *Preq: Sr. standing. 3(3-0) F.* Labor management problems. Emphasis directed toward role of production supervision in textile and apparel plants. Study of NLRB decisions and court opinions involving textile and apparel corporations. POWELL

TAM 491 Special Topics in Textile and Apparel Management. *Preq: Sr. standing. 1-3 F,S.* Special topics related to textile and apparel management.

TAM 495 Senior Seminar in Textile and Apparel Management. *Preq: Senior standing and consent of instructor. Restricted to students in the School of Textiles. 1(1-0) F.* Topics of current interest in the textile and allied industries are presented by guest lecturers. Written reports and discussions required of students.

TAM 499 Independent Research in Textiles and Apparel. *Preqs: Senior standing and 2.75 GPA. Course may be taken twice provided projects are different. 2-3 F,S,Sum.* Directed undergraduate research in textiles and apparel through experimental, theoretical and literature studies in related problems.

Selected 500-Level Courses Open To Advanced Undergraduates

TAM 520 Yarn Processing Dynamics. *Preqs: MA 301 and CI or grad. standing. 3(2-2) F.*

TAM 530 Textile Quality Control. *Preq: TAM (TT) 330 or CI. 3(3-0) S.*

TAM 541 Theory and Practice of Knitted Fabric Production and Control. *Preqs: TAM (TT) 370 and CI. 3(3-0) F.*

TAM 549 Warp Knit Engineering and Structural Design. *Preq: TT 443. 3(3-0) S.*

TAM 555 Production Mechanics and Properties of Woven Fabrics. *Preqs: MA 301 and CI or grad. standing. 3(2-2) S.*

TAM 561 Mechanical and Rheological Properties of Fibrous Material. *Preq: MA 301. 3(2-2) S.*

TAM 562 Physical Properties of Fiber Forming Polymers. Fibers and Fibrous Structures. *Preqs: MA 301, PY 208. 3(3-0) F.*

TAM 563 Characterization of Structure of Fiber Forming Polymers. *Preqs: MA 301, PY 208. 3(3-0) F.*

TAM (EB) 585 Market Research in Textiles. *Preqs: TAM (EB) 482. 3(3-0) S.*

TAM 590 Special Projects in Textiles. *Preqs: Sr. standing or grad. standing, CI. 2-3 F,S,Sum.*

TAM 591 Special Topics. *Preq: CI. 1-4 F,S.*

TEXTILE CHEMISTRY

TC 203 Introduction to Polymer Chemistry. *Preq: CH 101. 3(3-0) F,S,Sum.* The organic reactions and principles necessary to understand the preparation properties and chemistry of polymers are surveyed; the synthesis, applications and behavior of the common classes of polymers are discussed with emphasis on those materials used in the textile industry; the chemistry and structure of natural and man-made fibers are given special attention.

TC 301 Technology of Dyeing and Finishing. *Preq: TC 203. 4(3-2) F,S,Sum.* Basic principles and procedures for the preparation, dyeing, printing, and finishing of natural and man-made fibers. The chemical nature of dyes and fastness properties, and the chemical nature of finishes used to impart specific end-use properties.

TC 305 Introduction to Color Science and Its Applications. *Preq: PY 212 or PY 208. 3(2-2) S.* Basic principles and applications of color science. Physical, physiological and psychophysical aspects of color, color perception, color specification, color measurement and color control. Laboratory and computer color graphics exercises to aid understanding of color science. McGREGOR, SMITH

TC 310 Textile Preparation and Finishing Chemistry. *Preq: TC 301. 3(3-0) S.* Topics in textile wet processing. Chemical mechanisms and unit operations in fabric preparation and finishing.

TC 320 Textile Dyeing and Printing. *Preqs: TC 203, TC 301; Coreq: CH 223. 3(3-0) F.* Topics in coloration of textile fibers; chemical and physical mechanisms in textile dyeing and printing. MOCK, RUCKER

TC 407 Wet Processing Operation and Quality Control. *Preqs: TT 250, TC 310, TC 320. 3(1-6) S.* Pilot-scale batch and continuous wet processing. Selection and use of process and quality control tests.

TC 412 Textile Chemical Analysis. *Preq: TC 203. 3(2-3) S.* Application of certain techniques of analysis to fibers, textile chemicals and textile processes; ultraviolet, visible and infrared spectrophotometry; chromatography; viscometry; interfacial tension; calorimetric, gravimetric and mechanical thermal analyses. Emphasis on solving problems of analysis involving such processes as sorption, solution, diffusion, crystallization, etc. BECK, RUCKER

TC 441 Theory of Physico-Chemical Processes in Textiles I. *Preqs: C in MA 231 or 241 and C in PY 205 or 211; Coreq: PY 212 or PY 208. 3(3-0) F.* First semester of a two-semester sequence. Systems and processes, thermodynamics. Applications to polymer and textile wet processing situations. SMITH, THEIL

TC 442 Theory of Physico-Chemical Processes in Textiles II. *Preq: TC 441. 3(3-0) S.* Second semester of a two-semester sequence. Ideal and non-ideal solutions, colligative properties. Electro chemistry, dyeing isotherms, chemical kinetics, surface chemistry, theory of repellency and other special topics. SMITH, THEIL

TC 451 Computers in Textile Wet Processing. *Preqs: MA 212, PY 212, T 301. 3(3-0) S.* An introduction to basic microelectronics and microelectronic circuit elements and to the available hardware including microprocessor chips, microcomputers and minicomputers. Direct digital control of wet processes will be examined using specific examples of current practical applications. MOCK

TC (CH) 461 Introduction to Fiber-Forming Polymers. *Preq: CH 223. 4(3-3) F.* Synthesis and properties of fiber-forming polymers. Step-growth and chain-growth polymerization. Survey of formation techniques for synthetic fibers. Relationships between chemical structure and physical properties of natural and synthetic fibers. GILBERT

TC 490 Special Topics in Textile Chemistry. *1-6 F,S,Sum.* Directed research or independent study or experimental course offerings in textile and polymer chemistry.

TC 491 Seminar in Textile Chemistry. *Preqs: TC 310, TC 320 and senior standing. 1(0-2) S.* Familiarizes student with the principal sources of textile chemistry literature and emphasizes importance of keeping abreast of developments in the field. Emphasizes fundamentals of technical writing. Reports, lectures arranged.

Selected 500-Level Courses Open To Advanced Undergraduates

TC 504 Fiber Formation—Theory and Practice. *Preqs: MA 301, PY 208 or CI. 3(3-0) F.*

TC 505 Theory of Dyeing. *Preq: CH 433 or CI. 3(3-0) S.*

TC 506 Color Science. *Preq: Sr. in TC or grad. standing. 3(2-2) F.*

TC 520 Chemistry of Dyes and Color. *Preqs: CH 221 and 223. 3(3-0) S.*

TC 530 The Chemistry of Textile Auxiliaries. *Preq: One year of organic chemistry. 3(3-0) F.*

TC 561 Organic Chemistry of High Polymers. *Preqs: TC (CH) 461, CH 331 or CH 431. 3(3-0) S.*

TC (CH) 562 Physical Chemistry of High Polymers—Bulk Properties. *Preqs: CH 220 or 223, CH 331 or 431. 3(3-0) F.*

TC 565 Polymer Applications and Technology. *Preq: One year of organic chemistry; TC 461. 3(3-0).*

TC (CHE) 569 Polymers, Surfactants and Colloidal Materials. *Preqs: CHE 316, CH 223. 3(3-0) F.*

TC (CHE) 570 Radiation Chemistry and Technology of Polymeric Systems. *Preqs: CH 221, 431. 3(3-0) S.*

TC 591 Special Topics in Textile Science. *Preqs: Sr. or grad. standing and CI. 1-4 F,S.*

TEXTILE ENGINEERING

TE 201 Polymer and Fiber Science and Engineering. *Preqs: MA 241, CH 105 or CH 107. 4(3-2) S.* Principles of polymer chemistry; chemical and physical properties of polymers; engineering principles of fiber formation; properties and uses of fibers.

TE 301 Textile Manufacturing Processes and Systems I. *Preqs: TE 201, PY 205, MA 242; Coreq: MAE 314 or CE 313. 4(3-2) F.* Engineering analysis of textile structures, especially yarns. Unit processes of production, handling and packaging. Production sequences, intermachine effects, machine design and their consequences on the textile product.

TE 302 Textile Manufacturing Processes and Systems II. *Preq: TE 301. 4(3-2) S.* Mechanisms used in the production of woven, knitted and nonwoven fabrics. Design and operation of these mechanisms and their impact on the fabric. System dynamics of the different fabric forming processes.

TE 303 Textile Chemical Processes. *Preqs: MAE 301, MAE 308, TE 302. 4(3-2) F.* Thermodynamic concepts of material and energy balances describing preparation, dyeing, drying, humidification and chemical reactor design for selected textile chemical wet processes.

TE 401 Textile Engineering Design I. *Preqs: TE 302; MAE 208 or CE 215; MAE 314 or CE 313; Coreq: TE 303. 4(3-3) F.* The design process including initial specification, design constraints, sources of information and design strategy. Development of fact finding ability in areas unfamiliar to the student. Analysis of existing designs and the development of improved or new designs.

TE 402 Textile Engineering Design II. *Preq: TE 401. 4(2-6) S.* Application of engineering and textile science to the design of textile machines and processes. Design, construction, and evaluation of a modular component of a selected machine.

TE 403 Mechanics of Fibrous Structures. *Preqs: TE 201, MA 341, MAE 314 or CE 313. 3(3-0) F.* Mechanics of fibrous structures including fibers, yarns and fabrics. Transverse isotropy of fibers; tensile, bending, and shear behavior of fabrics.

TE 404 Textile Process Quality Control. *Preqs: ST 361; TE 302; ECE 331. 4(3-2) S.* Defining and quantifying quality of textile products; quality control by statistical sampling and continuous monitoring. Design of continuous monitoring and control systems; applications to textile systems design.

TECHNOLOGY EDUCATION

TED 115 Wood Processing. *3(1-4) F,S.* Basic knowledge and skills needed to design and construct functional wood products. Includes a study of the tools, materials and processes used to machine, form, assemble and finish wood products. Laboratory activities in the design and construction of wood products. Teaching techniques are discussed. DeLUCA

TED 122 Metal Technology. *3(1-4) F,S.* Introduction to metal layout, cutting, machining, forming, fabricating, finishing processes, and current technologies. Experience in oxyacetylene welding, arc welding, gas tungsten arc welding, sheet metals, bench metals, heat-treating, and foundry work. HAYNIE

TED 221 Construction Technology. *3(1-4) S.* Overview of structures and their construction. Drawings and models completed in a laboratory environment to simulate construction methods.

TED 231 Design for Technology Education. *Preqs: GC 101 or GC 120, TED 115. 3(1-4).* Design and development of products and projects. Class and laboratory exercises with a variety of materials in a diversity of design applications.

TED 246 Graphic Arts Technology. *3(1-4).* Introduction to graphic arts technology. Basic skills are developed through laboratory experiences in photography and the fundamental processes associated with offset lithography, letterpress, and screen printing. PETERSON

TED 351 General Ceramics. *3(1-4).* Work with ceramic materials as a medium of expression to gain experience in the basic manufacturing processes of the ceramic industry. A study of the sources of clay, and the designing, forming, decorating, and firing of ceramic products.

TED 359 Electrical Technology I. *Preqs: MA 111, PY 212 or 221. 3(2-2).* Direct current, alternating current, and semiconductors. Measurement and circuit behavior. Experimentation with application circuits. HAYNIE

TED 360 Electrical Technology II. *Preq: TED 359. 3(2-2).* Continuation of Electrical Technology I with special emphasis on the application of digital logic and electronic communication principles in consumer and industrial products. Circuit construction and troubleshooting. HAYNIE

TED 384 Computer Applications in Industry. *3(1-4) S.* Computerized control systems used in industry including computers and controllers, automated machines, and robots. Students design and operate automated systems.

TED 430 Manufacturing Technology. *Preqs: GC 120, TED 115 or TED 122. 3(1-4) F.* Manufacturing organization, product design, and production system design. Students design, operate and evaluate a small-scale manufacturing system.

TED 476 Transportation Technology: Energy and Power. *Preqs: MA 111, PY 231. 3(1-4) F.* Theoretical and practical aspects of transportation. Topics include energy, energy conversion, transmission, and control; transportation systems and industries; and conservation of energy. Emphasis on laboratory testing, experimenting, developing; and on the use of equipment. WENIG

TED 490 Special Problems in Technology Education. *Preqs: Junior level standing and permission of Instructor. F,S.* An independent supervised investigation in a defined area of interest in Technology Education.

TEXTILE SCIENCE

TS 211 Introduction to Fiber Science. *Preqs: T 105; MA 131 or 141. 3(2-2) F,S,Sum.* Physical properties of fibers related to type and chemical structure. Includes parameters used to describe textile fibers, classification in terms of quality factors, their reactions to moisture, stress-strain properties, methods of measuring physical properties and relationship between polymer structure, fiber properties, and their utilization as a single fiber composites or blends of fibers.

TS 460 Physical Properties of Textile Fibers. *Preqs: MA 231, PY 212. 3(3-0) F,S.* The course covers structural and physical properties of textile fibers including mechanical, thermal, optical, frictional, electrical and moisture properties. The relationships between structure, properties and performance are considered.

TS 461 Mechanical Properties of Fibrous Structures. *Preqs: MA 341, TS 460. 3(3-0) S.* Interrelationships between elastic and viscoelastic mechanical properties of single fibers and assemblies of fibers. Emphasis placed on how uniqueness of fibers as elements of matter translate into assemblies also having unique properties. Assemblies covered include yarns, fabrics and fiber reinforced composites. Utility and properties of polyblend fibers discused. HERSH

Selected 500-Level Courses Open To Advanced Undergraduates

TES 500 Fiber and Polymer Microscopy. Preqs: MA 231, PY 212, T 203. 3(1-4) F.

TES 505 Textile Instrumentation and Control Systems. *Preqs: MA 341, PY 212 and one course in computer science. 3(3-0) F.*

TES 520 Yarn Processing Dynamics. *Preqs: MA 341 and CI or graduate standing. 3(2-2) F.*

TES 541 Theory and Practice of Knitted Fabric Production and Control. *Preqs: TT 370 and CI. 3(3-0) F.*

TES 549 Warp Knit Engineering and Structural Design. *Preq: TT 443. 3(3-0) S.*

TES 555 Production Mechanics and Properties of Woven Fabrics. *Preqs: MA 341 and CI or grad. standing. 3(2-2) S.*

TES 561 Mechanical and Rheological Properties of Fibrous Material. *Preq: MA 341. 3(2-2) S.*

TES 562 Physical Properties of Fiber Forming Polymers, Fibers and Fibrous Structures. *Preqs: MA 341, PY 208. 3(3-0) F.*

TES (MAT) 563 Characterization of Structure of Fiber Forming Polymers. *Preqs: MA 341, PY 208. 3(3-0) F.*

TES 589 Special Studies in Textile Engineering and Science. *Preq: Sr. or grad. standing. 1-4 F,S.*

TES 590 Special Projects in Textile Engineering and Science. *Preqs: Sr. or grad. standing, CI. 2-3 F,S,Sum.*

TEXTILE TECHNOLOGY

TT 220 Yarn Production Systems. *Preqs: MA 111, T 105. 3(2-2) F,S,Sum.* The principles of drafting, drawing and twist. Errors in drafting. Review of yarn numbering. Fiber opening, cleaning and blending. Short- and long-staple yarn production. Fiber and filament production. Texturing. Quality control.

TT 250 Textile Fabrics: Formation and Structure. *Preqs: T 105 and MA 111. 3(2-2) F,S,Sum.* Basic concepts in weaving, knitting and nonconventional fabric production systems. Fundamentals of the conversion of fibers and yarns into fabrics. Relationships of fabric design, construction and raw materials with properties and performance of end product.

TT 305 Fiberweb and Nonwoven Production. *Preqs: TC 203, PY 211 or 205; Coreqs: ST 361, PY 212 or 208. 3(2-2) F.* Fiberweb/nonwoven fabrics produced directly from fibers or their precursors. Physical and chemical nature of local bonding and fiber entanglement. Viable processes for producing these fabrics. Economic justification for process and production. Plant visits whenever possible.

TT (TAM) 320 Mechanics of Spun Yarn Manufacturing Systems. *Preq: TT 220; Coreq: TS 211. 4(3-2) F,S.* A study of machine-fiber interactions in spun yarn manufacturing processes such as: blending, drafting, spinning and packaging. The course will also analyze factors affecting production rate and quality requirement.

TT 341 Knitting Systems. *Preqs: TT 220, TT 250. 3(2-2) F,S.* Technology of producing knitted fabrics. Range of fabric structures. Emphasis on yarn preparation for knitting, basic mechanics associated with weft and warp knitting machines, patterning mechanisms, technologies of production, new developments and management of knitting operations.

TT 350 Fabrics and Their End Uses. *Preqs: Both TT 220 and TT 250 or T 200. 3(2-3) S.* A basic course in the relationship of end-use applications to the style and design of textile fabrics. Influence of current manufacturing technology will be discussed and the consumer viewpoint emphasized. MASSEY

TT 351 Weaving Systems. *Preq: TT 250. 3(2-2) F,S.* Technology of producing woven fabrics, yarn preparation for weaving, basic loom mechanisms for shuttle and shuttleless looms, new developments and management of weaving operations.

TT 370 Technical Aspects of Fabric Design. *Preq: Two courses out of TT 341, 351 and 305. 4(3-2) S.* Properties of woven, knitted and nonwoven fabrics. Computer techniques and other methods of reproducing structural designs and means of designing fabrics to specifications. Laboratory consists of projects involving design analysis and testing.

TT 405 Contemporary Nonwoven Textiles. *Preqs: TT 305, senior standing and consent of instructor. Limited to 25 students. 3(1-4) S.* Group studies of selected nonwoven textile products and processes with format characteristics of contemporary R&D performed in a studio setting. Groups will pursue advanced study of systems for direct conversion of fiber to fabrics including plant, processes and equipment layout, labor assignment, costs of manufacture, material flow, capital cost and market projections. GEORGE

TT 420 Modern Developments in Yarn Manufacturing. *Preq: Senior standing. 3(3-0) S.* The modern and emerging systems of yarn manufacturing with emphasis on the economic consequences of changes. Optimization of new and existing equipment to minimize costs and maximize the competitive position of the user. LORD

TT 425 Textured Yarn Production and Properties. *Preqs: TS 211, TT 220, PY 211; Coreq: PY 212. 3(2-2) F.* Emphasizes the structure of continuous filaments and their responses to elevated temperatures, air flow and other methods of modification to produce bulked, textured and torque yarns. Related properties such as stress relaxation, and generation and control of electrostatic charges are also discussed. In addition, a field trip will be arranged if possible. EL SHIEKH, JOHNSON, TUCKER

TT 443 Advanced Knitting Systems and Fabrics. *Preq: TT 341. 3(2-2) F.* Loop forming concepts and mechanisms of complex warp and weft-knitted fabrics. Structural design and limitations, potential applications and knitability. Analysis of mechanical systems and tensioning forces on fabric formation. The effect on dimensional and mechanical properties. LITTLE, SMITH

TT 450 Advanced Weaving. *Preq: TT 351. 3(2-2) F. Alt. yrs.* New developments in weaving machinery, weaving of specialty fabrics and organization of weaving operations. MOHAMED

TT 451 Advanced Woven Fabric Design. *Preq: TT 370. 3(2-2) F. Alt. yrs.* Design and production requirements for highly specialized woven fabric structures. The laboratory activities will include a project on design from concept to final production and finishing. MOHAMED

TOXICOLOGY

Selected 500-Level Courses Open to Advanced Undergraduates

TOX 501 General Toxicology. *Preq: BCH 451, sr. or grad. standing. 3(3-0) F.*

TOX 510 Biochemical Toxicology. *Preqs: Biochemistry, sr. standing. 3(3-0) S.*

TOX 515 Environmental Toxicology. *Preq: Two years of biology. 3(3-0) F.*

TOX (ST) 563 Statistical Problems in Toxicology. *2(2-0) S. Alt. yrs.* (See statistics)

UNIVERSITY STUDIES

(See MDS—Multidisciplinary Studies)

VISUAL DESIGN

VD 217 Typography I. *Preq: DF 102. 3(1-4) F.* Typography as a medium of visual communication. Abstract, aesthetic and expressive qualities of letterforms; compositional principles in typographic form; characteristics of the major families of typefaces; typographic terminology and measurements.

VD 242 History of Graphic Design. *3(2-2) F.* Events, ideas, movements, designs and individuals that have historical significance and influence on contemporary graphic design and the graphic design profession. Concentration on graphic design of the last 100 years. LANGE

VD 255 Visual Design Materials and Processes I. *Preq: DF 102. 3(2-2) F.* Basic tools and materials of visual design. Basic technical hand skills; methods of presentation and production of printed matter.

VD 256 Visual Design Materials and Processes II. *Preq: VD 255. 3(2-2) S.* Introduction to graphic production equipment, materials, and processes as applied to the communication of visual ideas.

VD 317 Typography II. *Preq: VD 217. 3(1-4) S.* Continued investigation into the uses of typography; traditional typefaces, typographic history; technical details of typesetting; typographic formats and specification; organization of space.

VD 400 Visual Design Studio. *Preq: DF 102. 6(0-9) F,S,Sum.* Visual communication design through a series of studio experiences. Issues range from formal and aesthetic organizational principles to the formulation of information systems applied to practical communication problems.

VD 494 Internship in Visual Design. *Preqs: Junior standing in Visual Design; 3.0 GPA or better; and written approval of department head. Maximum 6 credit hours. 3-6 F,S.* Supervised field experience in visual design offices and organizations.

VD 495 Independent Study in Visual Design. *Preqs: Junior standing in Visual Design; 3.0 GPA or better; and approval of department head. Maximum 6 credit hours. 1-3 F,S.* Special projects in visual design developed under the direction of a faculty member on a tutorial basis.

Selected 500-Level Courses Open to Advanced Undergraduates

VD 517 Advanced Typographic Systems. *Preq: DN 217 and 317. 3(2-2) F.*

VD 518 Advanced Typographic Expression. *Preq: DN 217 and 317. 3 (2-2) S.*

VETERINARY MEDICINE

VMF 401 Poultry Diseases. *4(3-3) S.* The major infectious, noninfectious and parasitic diseases of poultry are studied with respect to economic importance, etiology, susceptibility, dissemination, symptoms and lesions. Emphasis upon practices for prevention, control and treatment of each disease.

VMF 420 Diseases of Farm Animals. *Preq: CH 103. 3(3-0) S.* Pathology of bacterial, viral, parasitic, nutritional, thermal and mechanical disease processes for farm animals. This emphasis practices for prevention and control of each disease.

VMS 490 Special Topics in Veterinary Medicine. *Preq: Approval of department. Undergraduate students only. 1-6 F,S,Sum.* Offered as needed to cover new or special subject matter within the scope of veterinary medicine at the undergraduate level.

Selected 500-Level Courses Open To Advanced Undergraduates

VMS 530 Veterinary Histology. *Preqs: BCH 451 and CI. 3(2-4) Alt. F.*

VMS 540 Research Animal Care and Use. *Preq: ZO 201 or equivalent. 3(2-3) Alt. S.*

VMS 590 Special Topics in Veterinary Medical Sciences. *Preq: Sr. or grad. standing. 1-3 F,S,Sum.*

WOOD AND PAPER SCIENCE

WPS 101 Introduction to Wood and Paper Science. *1(1-0) F.* Wood utilization in solid, fiber, and chemical form. Curricula and careers in wood utilization.

WPS 102 Introduction to Pulp & Paper Science & Technology. *1(1-0) S.* Introduction to terminology and technology specific to the pulp and paper industry with emphasis on the processes by which wood is converted into paper products. JOYCE

WPS 201 An Introduction to Wood Structure, Properties and Products. *Not for students enrolled in FOR and WP. 3(2-3) F.* The study of wood as a raw material. Structure and physical properties of wood and their influence on wood use. The manufacturing processes, properties and use of important commercial products. Laboratories concerned with wood identification and experiments on wood's physical properties. THOMAS

WPS 202 Wood Structure and Properties I. *Preq: BS 100 or BO 200. 3(2-3) S.* Formation, anatomy, and properties of wood. Structural features of softwoods and hardwoods and the relationships among anatomy, physiology, physical and mechanical properties. Variability, naturally occurring defects, and wood deterioration are discussed and related to wood utilization. Techniques on hand lens and microscopic identification of wood.
WHEELER

WPS 203 Wood Structure and Properties II. *Preqs: WPS 202, PY 211. 4(3-2) S.* Physical properties of wood, specific gravity relationships, wood in relation to moisture, heat, sound, light, electricity, combustion, introduction to strength properties of wood. HART

WPS 205 Wood Products Practicum. *Preq: WPS 202 or 203. 5 Sum.* Preparation of drawings and bill of materials for a furniture item. Parts are machined, assembled, and finished. Lumber grading, drying, and gluing principles. Four to five days are spent visiting industries to provide an appreciation for products and processes. The student is responsible for room and board; transportation is provided. GILMORE, KELLY

WPS 210 Forest Products Internship. *Preq: Completion of summer practicum. 1 F,S,Sum.* Experience in the forest products or related industries with a departmentally selected employer.

WPS 211 Pulp and Paper Internship. *Preq: Completion of soph. year. 1(1-0).* Experience in the pulp and paper industry. The student is assigned problem solving in an industrial setting to gain insight of pulp and paper technology. Students write a report on their experience. HEITMANN

WPS 240 Wood Products. *3(3-0) F.* Introduction to forest products industries, including the economic importance, current manufacturing technology, raw material requirements and the future of the industries. THOMAS

WPS 242 Wood Fiber Analysis. *2(2-0) S.* The macro and micro structure of wood and the relationships of anatomical structures to the physical properties of wood and paper. WHEELER

WPS (FOR) 273 Quantitative Methods in Forest Resources. *3(2-2) S.* (See Forestry.)

WPS 301 Wood Processing I. *Preqs: WPS 202 or WPS 203; WPS 205. 4(3-2) F.* The processes of drying, gluing, and finishing wood. Insect, fungal, and thermal degradation of wood. Drying procedures, glued wood products, furniture and panel finishing, and treatments to prevent biological and thermal degradation. Current industrial equipment and processes.

WPS 302 Wood Processing II. *Preqs: WPS 202 or WPS 203; WPS 205. 4(3-2) S.* Theories and techniques of processing raw wood into useable products. Principles of operation of current industrial wood milling equipment including primary and secondary processing. Machining of reconstituted wood products.

WPS 316 Wood-Polymer Principles. *Preqs: WPS 203; CH 103 or 107. 4(4-0) S.* Basic organic chemical and polymeric terminology and principles necessary for understanding the chemical components and macrostructure of wood as well as the adhesives and finishes used in wood products manufacturing. The chemical and physico-chemical properties of wood based on polymeric chemical structure. Finishing and adhesive systems used in wood products manufacturing.

WPS 321 Pulp and Paper Technology I. *Preqs: CH 107. 3(3-0) F.* Physical and chemical characteristics of wood and cellulose. Chemistry and technology of major mechanical, chemical and semichemical processes employed in the manufacture of pulp and paper. CHANG

WPS 322 Pulp and Paper Technology II. *Preq: WPS 321. 3(3-0) S.* Processing of fibers into paper via the many commercial systems used in the paper industry. HEITMANN

WPS 332 Wood and Pulping Chemistry. *Preqs: CH 221, 223; PY 205, PY 208; CH 331 or CH 431 or CHE 315. 4(3-3) S.* Introduction to carbohydrate chemistry focusing on the structure and reactivity of wood polysaccharides, hemicelluloses and cellulose and on the chemical structure of lignins and wood extractives. Special emphasis on the chemical reaction of wood components occurring in pulping and bleaching processes. GRATZL

WPS 344 Introduction to Quality Control in Wood Products. *Preq: ST 361. 3(3-0) S.* Statistical quality control techniques applicable to the manufacture of wood products. Control chart techniques for monitoring defects, defectives and measurements. Acceptance sampling procedures. Examples from the wood products industries will be used. HART

WPS 350 Wood Products Literature. *Preq: Junior standing in Wood Products. 2 (variable) S.* Exploration of the wood products literature; use of library services, oral and written reports, with emphasis on independent study.

WPS 355 Pulp and Paper Unit Processes I. *Preq: CHE 205; Coreq: WPS 321. Not open to PPT-Chemical Engineering Concentration students. 3(3-0) S.* Selected topics in chemical engineering as applied in the pulp and paper industry. Emphasis on computational practice. KIRKMAN

WPS 360 Pulp and Paper Unit Processes II. *Preqs: WPS 355, WPS 321; Coreq: WPS 322. 3(3-0) F.* Application of chemical engineering principles to the analysis of pulp and paper unit processes. Emphasis on practical problems in fluid dynamics, heat transfer, mass transfer, and thermodynamics. JAMEEL

WPS 403 Paper Process Analysis. *Preqs: WPS 321, 322. 3(1-6) S.* Manufacture of several types of papers with attention to stock preparation, sizing, filling and coloring. The finished products are tested physically and chemically and evaluated. HEITMANN

WPS 410 Pulp and Paper Systems Analysis & Control. *Preqs: WPS 360 or CHE 312; WPS 322. 4(3-2) S.* Application of systems analysis to the design and control of pulp and paper unit operations. Process analysis, modeling, simulation, and control. Computer simulation used as an analysis tool. KIRKMAN

WPS 413 Paper Properties and Additives. *Preq: Sr. standing in PPT. 4(2-6) F.* The material science of paper and paperboard. Standard testing methods for paper: measurement and characterization of the structural, mechanical, and optical properties of paper; chemical analysis; microscopic examination; identification and evaluation of colorants; color matching. Effect of additives on paper properties. Relationship between paper properties and end use requirements. OLF

WPS 415, WPS 416 Project Management and Analysis I and II. *Preq for WPS 415: Sr. standing in PPT. Preq for WPS 416: WPS 415. 2(2-0) for each. F,S.* A two course sequence in the design, management, and analysis of technical projects. Practice in written and oral presentation of results. JAMEEL, JOYCE

WPS (FOR) 423 Forest Machinery and Systems. *Preq: Junior standing in FOR, WP or BAE. 3(2-3).* See Forestry Department.

WPS (FOR) 434 Management Decision Making in Forestry and Wood Products. *Preqs: FOR (WPS) 273 and MA 113 and 114. 3(3-0) F.* See Forestry Department.

WPS 441 Wood Mechanics. *Preqs: MA 231, PY 212. 4(3-3) F.* Statics and forces in trusses. Elementary and orthotropic elasticity. Beam theory including effect of shear. Elastic stability and design of columns and beams. Effect of wood anatomy on mechanical properties and failure. Influence of density, age, growth stresses, moisture, temperature and duration of load. Creep and mechanosorptive deformation. Visual and mechanical grading. Derivation of allowable values. Structural fasteners.

WPS 444 Wood Composites. *Preq: Senior standing in Wood Products. 3(3-0) S.* Manufacture, properties, and processing of wood-based composites. Commodity products—plywood, particleboard, waferboard, and oriented strandboard—as well as specialty composite products.

WPS 450 Wood Industry Case Studies. *Preq: Sr. standing in WP. 2(1-3) S.* Presentation of relevant Wood industry problems involving material selection, processing and managerial techniques. Causes of in-use failures of wood products and means of prevention. KELLY

WPS 471 Pulping Process Analysis. *Preq: WPS 321, 322. 3(1-6) F.* Preparation and evaluation of different types of wood pulp. A new wood raw material is selected each year with the purpose of studying and critically evaluating the principal pulping and bleaching variables. JAMEEL

WPS 482 Projects in Wood Science and Technology. *Preq: Senior standing in WP. 2 F,S,Sum.* Individual library or laboratory research projects selected and conducted with the approval and guidance of faculty.

WPS (EB) 485 Management Development Seminar. *Preq: EB 201 or EB 212. This course may not be used for credit toward an economics minor for any graduate degree. 3(3-0) F.* (See Economics.)

WPS 491 Special Topics in Wood and Paper Science. *1-4 F,S,Sum.* Independent study of management or technology problems selected with faculty approval or the offering of experimental courses.

Selected 500-Level Courses Open To Advanced Undergraduates

WPS 513 Tropical Woods. *Preq: WPS 202. 2(1-3) Alt. F.*

WPS 515 Surface and Colloid Chemistry of Papermaking. *Preq: CH 331 or CH 431. 3(3-0) Alt. S.*

WPS 521 Chemistry of Wood Polysaccharides. *Preqs: CH 223 and WPS 332 or BCH 451. 3(3-0) Alt. F.*

WPS 522 Chemistry of Lignin and Extractives. *Preqs: CH 223 and WPS 322 or BCH 451. 3(3-0) Alt. S.*

WPS 525 Pollution Abatement in Forest Products Industries. *Preq: Grad. or advanced undergrad. standing in science or engineering curricula. 3(3-0) S, Alt. yrs.*

WPS 533 Advanced Wood Anatomy. *Preq: WPS 202 or CI. 3(1-6) F. Alt. yrs.*

WPS 540 Wood Composites. *Preqs: WPS 441; grad. or advanced undergrad. standing. 3(3-0) Alt. S.*

WPS 560 Advanced Pulp and Paper Process Analysis. *Preqs: WPS 321 and 322. 3(3-0) F. Alt. yrs.*

ZOOLOGY

ZO 201 General Zoology. *Preq: BS 100 or 105. 4(3-3) F,S,Sum.* Biology of the major groups of animals, with emphasis on general structural plans and diversity, reproduction, development, ecology, behavior and evolution.

ZO 205 Introduction to Cellular and Developmental Zoology. *Preq: BS 100. 4(4-0) F.* Basic concepts and principles of cellular and developmental zoology with emphasis on cellular chemistry, structure and function. Molecular biology, differentiation, and processes involved in morphogenesis. ROBERTS

ZO 208 Introduction to Organismal and Evolutionary Zoology. *Preq: BS 100. 4(4-0) S.* Basic concepts of organismal zoology. Principles of evolution, ecology, behavior, physiology and morphology. Introduces various animal phyla in which these principles are applied to living organisms. WALTERS

ZO 212 Basic Anatomy and Physiology. *Preq: BS 100. 4(3-3) F.* Major emphasis on the structure and function of the muscular, skeletal, circulatory and nervous systems.

ZO (MEA) 220 Marine Biology. *Preq: MEA 200 or BS 100. One weekend field trip required. 3(3-0) S.* (See Marine, Earth, and Atmospheric Sciences.)

ZO (FW) 221 Conservation of Natural Resources. *3(3-0) F,S,Sum.* (See Fisheries and Wildlife Sciences.)

ZO 290 Special Topics in Zoology. *Preq: BS 100. 1-4 Periodically.* Variable use for introductory courses to be taught experimentally.

ZO 303 Vertebrate Zoology. *Preq: ZO 201 or ZO 208. 4(3-3) F,S.* Biology of the vertebrates; their adaptations and evolutionary history. Comparative physiological, developmental, behavioral and anatomical studies. BARTHALMUS

ZO 305 Cellular and Animal Physiology Laboratory. *Preq: ZO 205. 2(0-5) F,S.* Cellular and physiological techniques and experimentation. Experiments on cells and functions of animal organ systems.

ZO 315 General Parasitology. *Preq: ZO 201 or ZO 208. 3(2-3) S.* Life history, pathology and control of some common parasites of humans and important wild and domestic animals. G. MILLER

ZO 323 Comparative Anatomy. *Preqs: ZO 201 or 303; or ZO 208. 4(2-4) S.* A comparative morphology of vertebrates demonstrating the interrelationships of the organ system of the various groups.

ZO 345 Histology. *Preq: ZO 205 or ZO 323 or 303. 4(2-4) F.* Microscopic anatomy of animal tissues. BRADBURY

ZO (FW) 353 Wildlife Management. *Preqs: BS 100, ZO 201 or ZO 303. 3(3-0) F.* (See Fisheries and Wildlife Sciences.)

ZO (BO) 360 Introduction to Ecology. *Preq: A 200 level biology course. 3(3-0) F,S,Sum.* (See Botany.)

ZO 361 Principles of Embryonic Development. *Preq: ZO 205 or ZO 208 or ZO 303. 3(3-0) F,S.* The basic principles of embryonic development are revealed through an integrated study of descriptive and experimental embryology. The development of both invertebrates and vertebrates is considered at levels of organization ranging from molecular to organismal.

ZO (BO) 365 Ecology Laboratory. *Preq:. 1(0-3) F,S,Sum.* (See Botany.)

ZO 365H Honors Ecology Laboratory. *Preq: GPA 3.0 or higher; Coreq: ZO 360. Credit not allowed for both 365 and 365H 1(0-3) F.* Honors laboratory coordinated with ZO (BO) 360 lecture, provides introductory observations in laboratory and field settings. Two laboratory reports in scientific format and occasional duties outside scheduled hours are required. Optional weekend field trips out of town, housing and food at student expense.

ZO 402 Invertebrate Zoology. *Preq: ZO 201 or 208. 2(2-0) S. Alt. Yrs.* Survey of invertebrate phyla, excluding the Protista, emphasizing their functional biology. BRADBURY

ZO 403 Invertebrate Zoology Laboratory. *Preq: ZO 201 or 208. 2(0-6) S. Alt. Yrs.* Examination of living and preserved invertebrates to study their distinguishing characteristics and to observe anatomical modifications for function. BRADBURY

ZO 410 Introduction to Animal Behavior. *Preqs: ZO 201, or 208 or 303 and ZO 421. 3(3-0) F.* Studies of animal behavior in vertebrates and invertebrates including physiological mechanisms and adaptive significance. BARTHALMUS

ZO (BO) 414 Cell Biology. *Preqs: CH 223, PY 212, ZO 205 or 303. 3(3-0) S.* The chemical and physical bases of cellular structure and function with emphasis on methods and interpretations. ROBERTS

ZO 419 Limnology. *Preqs: BO (ZO) 360, CH 107. Credit in both ZO 419 and ZO 519 is not allowed. 4(3-3) F.* Structure and function of lakes and ponds, including physical, chemical and biological controls of productivity and species composition of aquatic plants and animals, and effects of pollution on water quality. One local weekend field trip is required. MOZLEY

ZO (FW) 420 Fishery Science. *Preqs: ZO 201 or 303; ZO 360. 3(2-2) F.* (See Fisheries and Wildlife Sciences.)

ZO 421 Principles of Physiology. *Preqs: CH 223, ZO 205 or equivalent. 3(3-0) F,S,Sum.* A comprehensive survey of the processes involved in the function of specialized cells, tissues and organ systems. Emphasis on basic concepts with orientation toward mammalian and human systems. SMITH, UNDERWOOD

ZO 422 Biological Clocks. *Preqs: BO 100, ZO 205, ZO 208. Credit in both ZO 422 and ZO 522 is not allowed. 3(3-0) S.* The anatomy, physiology, and development of biological clocks in a variety of organisms, including humans. UNDERWOOD

ZO (ENT) 425 General Entomology. *Preq: ZO 201 or equivalent. 3(2-3) F,Sum.* (See Entomology.)

ZO (FW) 430 Fisheries and Wildlife Administration. *Preqs: Political science course and either FW (ZO) 420 or FW (ZO) 353; advanced undergraduate or graduate standing. 3(3-0) S.* (See Fisheries and Wildlife Sciences).

ZO 441 Biology of Fishes. *Preqs: ZO (BO) 360. 3(3-0) F.* Behavior, evolution, physiology and ecology of fishes, emphasizing their adaptations for life in streams, lakes, and oceans. J. MILLER

ZO 442 Biology of Fishes Laboratory. *Preq: BO (ZO) 360; Coreqs: ZO 441. 1(0-3) F.* Field and laboratory exercises with the common fish species and communities of North Carolina. Field trips to local streams and lakes plus weekend trips to coastal, estuarine, and mountain habitats. J. MILLER

ZO 450 Evolutionary Biology. *Preq: ZO 205, ZO 208. GN 411 recommended. 3(3-0) F.* Principles and patterns of organic evolution. Origin of life, patterns of genetic variability within populations; adaptations, natural selection, and the formation of species. The living world as an historical process governed by diverse principles of organization.

ZO 460 Aquatic Natural History Laboratory. *Preqs: Two BO and/or ZO courses. 2(0-6) S.* Field and laboratory study of common freshwater organisms other than fish and birds. Emphasis on taxonomy of orders and some families, and adaptations of structure and behavior to aquatic environments. Effect of pollution, conservation approaches and aquarium culture. Several weekend field trips required. MOZLEY

ZO 480 Laboratory Techniques in Cellular Biology. *Preq: ZO 305, CH 223. 3(0-6) F,S.* Selected laboratory techniques utilized in modern biological research including immunochemistry, tissue culture, microscopy, and the detection and isolation of recombinant proteins expressed in bacteria.

ZO 492 External Learning Experience. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

ZO 493 Special Problems/Research Exploration. *Preq: Sophomore standing. 1-6 F,S.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

ZO 495 Special Topics in Zoology. *Preq: Twelve hours ZO. 1-3 F,S,Sum.* Offered as needed for development of new courses in various areas of zoology.

Selected 500-Level Courses Open To Advanced Undergraduates

ZO 501 Ornithology. *Preqs: BO (ZO) 360; ZO 201 or ZO 303. 3(2-3) F.*

ZO (PHY) 503 General Physiology I. *Preq: Sr. or grad. standing. The following courses are recommended: ZO 421 or equivalent, BCH 451 or equivalent, a year of physics. 3(3-0) F.*

ZO (PHY) 504 General Physiology II. *Preq: ZO (PHY) 503. 3(3-0) S.*

ZO (ENT) 509 Ecology of Stream Invertebrates. *Preqs: ZO 201 or 208, BO (ZO) 360 or equivalent. 4(2-6) S, Odd yrs.*

ZO 512 Animal Symbiosis. *Preq: 12 hrs. of biology and zoology. 3(3-0) S, Odd yrs.*

ZO (PHY) 513 Comparative Physiology. *Preq: ZO 421 or CI. 4(3-3) F, Odd yrs.*

ZO (FW) 515 Growth and Reproduction of Fishes. *Preqs. or Coreqs: GN 411, ZO 420, 421, 441. 3(2-3) F, Odd yrs.*

ZO (MEA) 520 Principles of Biological Oceanography. *Preqs: BO (ZO) 360 or grad. standing. 3 (3-0) S.*

ZO (PO) 524 Comparative Endocrinology. *Preq: ZO 421 or equivalent. 4(3-3) S.*

ZO 544 Mammalogy. *Preq: ZO 323 or ZO 303. 4(3-3) F.*

ZO (FW) 553 Principles of Wildlife Science. *Preq: ZO (BO) 360. 3(2-3) F.*

ZO (MB) 555 Protozoology. *Preq: CI. 4(2-6) S, odd yrs.*

ZO (BO) 560 Principles of Ecology. *Preq: Three semesters of college-level biology courses. 4(3-3) F.*

ZO 581 Helminthology. *Preqs: ZO 315 or equivalent. 4(2-4) F, odd yrs.*

ZO (ENT) 582 Medical and Veterinary Entomology. *Preqs: ENT 312 or 425 and ZO 315 or equivalent 3(2-3) Alt. S.*

ZO (FW) 586 Aquaculture I. *Preqs: ZO (BO) 360, sr. or grad. standing. 3(3-0) F, Even yrs.*

ZO (FW) 587 Aquaculture I Laboratory. *Preqs: ZO (BO) 360, sr. or grad. standing; Coreq: ZO 586. 1(0-3) F, Even yrs.*

ZO 590 Special Studies. *Preqs: Twelve hours ZO, CI. Credits arranged. F,S.*

ZO 592 Topical Problems. *Preq: CI. 1-3 F,S.*

ZO 593 Aquatic Ecology Seminar. *Preqs: Grad., PBS, or sr. standing; one course in aquatic, marine or fisheries area. 1-3 F,S.*

The University of North Carolina

The University of North Carolina is comprised of all the public institutions of higher education in North Carolina that confer degrees at the baccalaureate level or higher. The University was authorized by the State Constitution in 1776, and it was chartered in 1789 by the General Assembly.

The University of North Carolina opened its doors to students at Chapel Hill in 1795. Thereafter, beginning in the latter part of the nineteenth century, the General Assembly of North Carolina has established and supported fifteen other public senior institutions in keeping with Article IX, Section 8, of the Constitution of North Carolina which provides that the "General Assembly shall maintain a public system of higher education, comprising The University of North Carolina and such other institutions of higher education as the General Assembly may deem wise."

By 1969, The University of North Carolina included six constituent institutions, governed by a single board of trustees. This multi-campus university had its beginnings in legislation enacted in 1931 that defined The University of North Carolina to include The University of North Carolina at Chapel Hill, North Carolina State University at Raleigh, and University of North Carolina at Greensboro. In the 1960's three additional campuses were added: The University of North Carolina at Charlotte, The University of North Carolina at Asheville, and The University of North Carolina at Wilmington.

Beginning in 1877, the General Assembly of North Carolina established or acquired ten additional separately governed state-supported senior institutions of higher education. They are: Appalachian State University, East Carolina University, Elizabeth City State University, Fayetteville State University, North Carolina Agricultural and Technical State University, North Carolina Central University, North Carolina School of the Arts, Pembroke State University, Western Carolina University, and Winston-Salem State University. Then, in 1971, the General Assembly redefined The University of North Carolina, and under the terms of that legislation all sixteen public senior institutions became constituent institutions of The University of North Carolina.

The constitutionally authorized Board of Trustees of the six-campus University of North Carolina was designated the Board of Governors; and this body is by law The University of North Carolina. The Board of Governors consists of thirty-two members elected by the North Carolina General Assembly, and it is charged with "the general determination, control, supervision, management, and governance of all affairs of the constituent institutions." The chief executive officer of the university is the president.

Each constituent institution of The University has its own faculty and student body. The chief administrative officer of each institution is the chancellor, and the chancellors are responsible to the President.

Each constituent institution also has a board of trustees composed of thirteen members: eight elected by the Board of Governors, four appointed by the Governor, and the elected president of the student body ex officio. (The School of the Arts has two additional ex officio trustees.) The principal powers of these institutional boards are exercised under a delegation of authority from the Board of Governors.

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North Carolina State University

HISTORICAL SKETCH

On March 7, 1887, the North Carolina General Assembly passed the act which authorized the establishment of the North Carolina College of Agriculture and Mechanic Arts. The Watauga Club of Raleigh and the statewide farmers' movement had convinced the legislature of the need to transfer the funds received by the state under the provisions of the Morrill Land-Grant Act of 1862 from the University of North Carolina in Chapel Hill to a new land-grant college in Raleigh. The cornerstone of A. and M. College was laid in August, 1888, and its doors were officially opened in October 3, 1889.

Alexander Q. Holladay, the college's first president (1889-1899), and a faculty of five offered courses in agriculture, horticulture, pure and agricultural chemistry, English, bookkeeping, history, mathematics, physics, practical mechanics, and military science. The first freshman class numbered about fifty students. By the end of the institution's first decade the resident enrollment had reached 300.

During the administration of **George T. Winston** (1899-1908) a new curriculum in textiles was developed and normal courses were offered in the summer for public school teachers, both men and women. The Agricultural Extension Service was established during the administration of **Daniel H. Hill** (1908-1916) and enrollment grew to more than 700. In 1917, during the administration of **Wallace C. Riddick** (1916-1923), the institution's name was changed to North Carolina State College of Agriculture and Engineering. The introduction of the word engineering was intended to reflect the increasing emphasis on the professional and theoretical as well as the practical aspects of technical education.

In 1923 a major reorganization of the administration of the college was begun, and President Riddick resigned to become the first dean of the new School of Engineering. **Eugene Clyde Brooks** (1923-1934), the fifth president of State College, continued the reorganization with the creation of the School of Agriculture (later renamed the School of Agriculture and Forestry), the School of Science and Business, the School of Education, the School of Textiles, and the Graduate School. Resident enrollment rose to nearly 2000 in 1929 before the Depression caused a drop to approximately 1,500 in 1933. The first women graduates of State College received their degrees in 1927.

In the midst of the Depression the General Assembly of 1931 attempted to promote economy and to prevent unnecessary duplication among the three leading state institutions of higher education by establishing a single consolidated administration for the University of North Carolina in Chapel Hill, North Carolina State College of Agriculture and Engineering, and North Carolina College for Women in Greensboro. Dr. Frank Porter Graham, president of the University of North Carolina, was elected president of the consolidated university, and Dr. Brooks, with the title of vice president, continued as chief administrative officer at State College. Among the consequences of consolidation were the phasing out of the School of Engineering at Chapel Hill and the School of Science and

Business at Raleigh. A general college, later called the Basic Division, was established to provide two years of basic courses in humanities, social sciences, and natural sciences as a foundation for students in the various degree-granting technical and professional schools.

Colonel **John W. Harrelson** (1934-1953), Class of '09, was the first alumnus to become administrative head of State College. Under the consolidated organization his title was Dean of Administration; later it was changed to Chancellor. During Harrelson's administration the institution experienced the beginning of extraordinary growth in the aftermath of World War II. Two new schools were established: the School of Design and the School of Forestry. A multi-million dollar expansion program was completed during the administration of **Carey H. Bostian** (1953-1959), and the program of student activities was greatly enlarged, as the enrollment passed 5,000.

The faculty and student population more than doubled during the administration of **John T. Caldwell** (1959-1975) and another new school was organized: the School of Physical Sciences and Applied Mathematics (now Physical and Mathematical Sciences). The School of General Studies, the successor to the Basic Division, was renamed the School of Liberal Arts. The name Liberal Arts was when the school was authorized to offer a full range of bachelor's and master's degree programs in the humanities and social sciences. The name of the institution itself was changed in 1965 to North Carolina State University, signifying its new role as a comprehensive university.

NCSU's enrollment passed 20,000 during the administration of Chancellor **Joab L. Thomas** (1976-1981). The School of Veterinary Medicine was established, the name of the School of Liberal Arts was changed to School of Humanities and Social Sciences, and North Carolina State University was recognized as one of two major research universities within the statewide University of North Carolina.

Bruce R. Poulton (1982-1990) became chancellor in the fall of 1982. A major expansion of the University's research budget, the establishment of a substantial endowment to provide enlarged resources for research equipment and endowed professorships, and the addition of the 1,000-acre Centennial Campus occurred during this administration. All of the schools were renamed colleges except for the School of Design and The Graduate School. In addition, the School of Education became the College of Education and Psychology.

In 1990 **Larry K. Monteith**, former Dean of the College of Engineering, became chancellor and NCSU's eleventh chief administrative officer. Among his early initiatives were the creation of the office of Dean for Undergraduate Studies and of the First Year Experience Program.

ROLE AND MISSION OF NORTH CAROLINA STATE UNIVERSITY*

North Carolina State University at Raleigh is one of the sixteen institutions that comprise The University of North Carolina. Within the statewide University it is classified as one of the two major research universities, offering degrees at the baccalaureate, master's and doctoral levels. It is one of the state's two land-grant institutions, and it has responsibility for the academic, research, and public service programs in areas of primary importance to the state's economy.

The University is organized in eight colleges, including Agriculture and Life Sciences, Education and Psychology, Engineering, Forest Resources, Humanities and Social Sciences, Physical and Mathematical Sciences, Textiles, and Veterinary Medicine. In addition, there are the School of Design and The Graduate School. The Graduate School serves the vital role of coordinating the research and graduate programs. North Carolina State University has state-wide responsibility for serving the major technical and technological segments of the state's economy. It also serves the special academic needs of the adult population in the Research Triangle area.

The special mission of North Carolina State University in the state's system of higher education stems from its land-grant origins. The land-grant philosophy is to maintain a people's university that is service oriented and maintains a direct relevance to the development of the people of the state, their economy, their environment, and the competence of their educational, social and governmental institutions.

North Carolina State University has statutory responsibility for advancing the major technologies of man and the sciences and arts on which they are based through teaching, research and public service, and for cultivating the aesthetic and social understandings which ensure the quality of life that technology helps make possible in a free society. Even though it is committed to function at high levels of intellectual sophistication in its research and public service, this University is also fully and continuously committed to high quality instruction at the undergraduate level.

Since its founding in 1887 as the state's land-grant campus, North Carolina State University has fulfilled a unique and critical intellectual role in the well-being of North Carolina and indeed the nation. Its thrust in the major technologies and basic sciences constitutes an essential service to the economic, social, and institutional life of the state.

Although North Carolina State University's performance in teaching, research, and extension programs is statewide in its geographical reach, it has a special relationship with the metropolitan area of the capital city, with state government, and with the Research Triangle in several of its programs. North Carolina State University holds that knowledge is powerful and precious. Genuine universities are knowledge centers. The modern university is useful in proportion to the quality of intellects of its faculty and their sense of responsibility to the community and to the manner in which these intellects are supported.

*Approved by the NCSU Board of Trustees on March 8, 1984.

Therefore, North Carolina State University must maintain the size of undergraduate and graduate enrollment and the breadth of curricula that are necessary to maintain a critical and relevant mass of intellectual endeavor.

At the apex of each major field of science and technology, as well as in certain fields of education and the social sciences, major research programs staffed by distinguished scholars have been necessarily interlinked with academic programs, especially at the doctoral level. Graduate study and scholarly research have not only expanded the frontiers of knowledge but they have provided training for college and university faculties, both public and private, throughout the state.

The land-grant mission in the development of North Carolina State University, however, has been best reflected by the insistence that knowledge acquired through research and teaching be utilized for the economic and social benefit of the people. Therefore, the University has throughout its history maintained aggressive programs of extension, adult and continuing education, and public service designed to put acquired knowledge to the immediate service of the general public. North Carolina's agricultural, industrial and urban life is based on modern science and technology and as such it depends heavily on dedicated, imaginative, and effective research to maintain its momentum. A large proportion of the public supported research that sustains the state's economic health is performed by North Carolina State University. Large and sophisticated research programs are conducted in the Colleges of Agriculture and Life Sciences, Engineering, Forest Resources, Physical and Mathematical Sciences, Textiles and Veterinary Medicine. In addition, there are relatively new programs in such inter-school areas as Water Resources, Marine Sciences, Operations Research and Urban Affairs.

Regardless of the field, research and scholarship are regarded as necessary and integral parts of the university endeavor. This is especially so if graduate programs are offered, for a good research program is a sine qua non for good graduate education. The intimate link between teaching and research makes it possible for the teaching faculty to continue their own education and maintain positions at the leading edge of scientific progress through research which involves their graduate students.

The tradition of extension and public service activities at North Carolina State University rests on the solid legislative mandate to be responsive to the continuing education and skill needs of our citizens. This legislative mandate is continually renewed and strengthened by both federal and state legislative bodies. Initial extension programs were directed to the agricultural sector. The University and the U.S. Department of Agriculture signed a memorandum of agreement on July 1, 1909, to conduct cooperative farm demonstration work in the state of North Carolina.

A Division of Continuing Education, now called the Division of Lifelong Education, was established in 1923 and is now a unit of University Extension which is the institution's major organizational structure to provide for the application of knowledge and technical assistance programs to meet the lifelong education needs of the public. In 1976 the Jane S. McKimmon Center for Extension and Lifelong Education was opened and serves as the hub for university extension and public service programs.

The School of Engineering established the Industrial Extension Service during the mid-1950's to aid in the development of the state's economy through experimental work and the application of technology to improve industrial and manufacturing processes.

The School of Textiles received state legislative support for extension activities in 1969.

Congress passed the National Sea Grant Act in 1966 built on the tradition of the earlier Land-Grant Act. A research and extension program has been developed with specific focus on the ocean, shoreline, and coastal zone. The North Carolina General Assembly endorsed this program in 1969 with state matching funds.

The major colleges of North Carolina State University are expressly designed to develop and diffuse knowledge in the fields most important to the well-being of the state, including Agriculture and Life Sciences, Design, Education and Psychology, Engineering, Forest Resources, Textiles, and Veterinary Medicine, and in basic supporting areas of Physical and Mathematical Sciences, and Humanities and Social Sciences. The Graduate School promotes excellence in all graduate programs across the University.

POLICY ON ILLEGAL DRUGS

The following policy on illegal drugs was adopted by the North Carolina State University Board of Trustees on April 16, 1988:

Purpose

Reflecting its concern over the threat which illegal drugs constitute to higher education communities, the Board of Governors of the University of North Carolina adopted a policy on illegal drugs on January 15, 1988. The Board of Governors' policy requires each constituent institution's Board of Trustees to develop a policy on illegal drugs applicable to all students, faculty members, administrators and other employees. The policy for each campus must address particular circumstances and needs while being fully consistent with specified minimum requirements for enforcement and penalties.

To assist North Carolina State University in its continuing efforts to meet the threat of illegal drugs, and to comply with the Board of Governors' policy, the Board of Trustees adopts the policy set forth below. This policy is intended to demonstrate the University's primary commitment to education, counseling, rehabilitation, and elimination of illegal drugs, as well as its determination to impose penalties in the event of violation of state and federal drug laws consistent with all due process protection rights.

Education, Counseling, and Rehabilitation

North Carolina State University shall maintain a program of education designed to help all members of the University community avoid involvement with illegal drugs. The educational program shall emphasize the incompatibility of the use or sale of illegal drugs with the goals of the University, the legal consequences of involvement with illegal drugs, the medical and psychological implications of the use of illegal drugs, and the ways in which illegal drugs jeopardize an individual's present accomplishments and future opportunities. Specific elements of the education program are:

1. Publicizing the University's policy in the Student Code of Conduct, the undergraduate and graduate catalogs, and other publications distributed to students, faculty, administrators, and other employees. The latter publications include the official bulletin, the Student Handbook, the Faculty Handbook, the Advisers' Handbook, and the Human Resources newsletter.
2. Continuing and expanding the drug education program conducted by Student Health Service.

3. Continuing development of courses on drug education.
4. Continuing the drug education component of the employees' Wellness Program.
5. Increasing the awareness and utilization of the University's Employee Assistance Program (EAP).

The University shall disseminate information about drug counseling and rehabilitation services that are available to members of the University community. Persons who voluntarily avail themselves of such services shall be assured that applicable professional standards of confidentiality will be observed and that such participation will not be the basis for disciplinary action. Specific counseling and rehabilitation efforts include:

1. Continuing the evaluation and referral services of the Counseling Center for outpatient and in-patient rehabilitation.
2. Continuing the consultation and evaluation portions of the Student Health Service's drug education program.
3. Utilizing the Employee Assistance Program's referral to existing community-based counseling and rehabilitation services.

Enforcements and Penalties

Students, faculty members, administrators, and other employees are responsible as citizens, for knowing about and complying with the provisions of North Carolina law that make it a crime to possess, sell, deliver, or manufacture those drugs designated collectively as "controlled substances" in Article 5 of Chapter 90 of the North Carolina General Statutes. The University will initiate its own disciplinary proceeding against a student, faculty member, administrator, or other employee when the offense is deemed to affect the interests of the University. Penalties will be imposed by the University in accordance with procedural safeguards applicable to disciplinary actions against students, faculty members, administrators, and other employees, as required by Section 502D(3) and Section 603 of the University Code, by Board of Governors' policies applicable to other employees exempt from the State Personnel Act, and by regulations of the State Personnel Commission. The penalties to be imposed by the University may range from written warnings with probationary status to expulsions from enrollment and discharges from employment. However, the following minimum penalties, as prescribed by the Board of Governors, shall be imposed for the particular offenses described.

Trafficking in Illegal Drugs

1. For the illegal manufacture, sale or delivery, or possession with intent to manufacture, sell or deliver, of any controlled substance identified in Schedule 1, N.C. General Statutes 90-89, or Schedule 11, N. C. General Statutes 90-90 (including, but not limited to, heroin, mescaline, lysergic acid diethylamide, opium cocaine, amphetamine, methaqualine), any student shall be expelled and any faculty member, administrator or other employee shall be discharged.
2. For a first offense involving the illegal manufacture, sale or delivery, or possession with intent to manufacture, sell or deliver, of any controlled substance identified in Schedules III through VI, N. C. General Statutes 90-91 through 90-94 (including, but not limited to, marijuana, penobarbital, codeine), the minimum penalty shall be suspension from enrollment or from employment for a period of at least one semester or its equivalent.* For a second offense, any student shall be expelled and any faculty member, administrator, or other employee shall be discharged.

Illegal Possession of Drugs

1. For a first offense involving the illegal possession of any controlled substance identified in Schedule I, N. C. General Statutes 90-89, or Schedule II, N. C. General Statutes 90-90, the minimum penalty shall be suspension from enrollment or from employment for a period of at least one semester or its equivalent.*
2. For a first offense involving the illegal possession of any controlled substance identified in Schedules III through VI, N. C. General Statutes 90-91 through 90-94, the minimum penalty shall be probation, for a period to be determined on a case-by-case basis. A person on

probation must agree to participate in a drug education and counseling program, consent to regular drug testing, and accept such other conditions and restrictions, including a program of community service, as the Chancellor or the Chancellor's designee deems appropriate. Refusal or failure to abide by the terms of probation shall result in suspension from enrollment or from employment for any unexpired balance of the prescribed period of probation.

3. For second or other subsequent offenses involving the illegal possession of controlled substances, progressively more severe penalties shall be imposed, including expulsion of students and discharge of faculty members, administrators or other employees.

Suspension Pending Final Disposition

When a student, faculty member, administrator, or other employee has been charged by the University with a violation of policies concerning illegal drugs, he or she may be suspended from enrollment or employment before initiation or completion of regular disciplinary proceedings if, assuming the truth of the charges, the Chancellor or, in the Chancellor's absence, the Chancellor's designee concludes that the person's continued presence within the University community would constitute a clear and immediate danger to the health or welfare of other members of the University community; provided, that if such a suspension is imposed, and appropriate hearing of the charges against the suspended person shall be held as prompt as possible thereafter.

Coordinator of Drug Education

The University Counsel will serve as coordinator of drug education and, acting under the authority of the Chancellor, will be responsible for overseeing all actions and programs relating to this institutional policy.

Implementation and Reporting

This North Carolina State University policy on illegal drugs shall be effective on the beginning of the fall semester of 1988.

Annually the Chancellor shall submit to the Board of Trustees a report on campus activities related to illegal drugs for the preceding year. The report shall include, as a minimum, the following: (1) a listing of the major education activities conducted during the year; (2) a report on any illegal drug-related incidents, including any sanctions imposed; (3) an assessment by the Chancellor of the effectiveness of the campus program; and (4) any proposed changes in the policy on illegal drugs. A copy of the report shall be provided to the President.

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INDEX

A

Academic fields of study and degrees, 15-21
Academic honors, 55
Academic policies and procedures, 50-65
Academic programs, special, 26-30
Academic Suspension Policy, 57
Academic Warning, 56-57
Accident and health insurance, 65
Accounting Department, 226-227; courses, 316-318; minor, 227
Accreditation, 7
Achievement tests, 36
Administration and Offices, NCSU, 8-10
Administrative Council, NCSU, 502
Admissions, 34-39
Adult and Community College Education, 87; courses, 355-356
Adult Credit Programs and Summer Sessions, 287
Advanced Electronic Materials Processing (AEMP), Center for, 292
Advanced placement, 36-37
Advising, academic, 50-51
Aerospace Engineering curriculum, 192-193
Aerospace Studies Department (Air Force ROTC), 284-285 courses, 325
African-American Studies minor, 235
Agricultural and Resource Economics Department, 90-92; courses, 356-357
Agricultural Business Management curriculum, 91-92; minor, 92
Agricultural Communications courses, 316
Agricultural Economics curriculum, 92; minor, 92
Agricultural Education Program, 140-143
Agricultural Extension Education concentration, 142-143
Agricultural Extension Service, 127
Agricultural Foundation, Inc., N.C., 300
Agricultural Institute, 18, 128-129; admission requirements, 36; classification of students, 51
Agricultural Research Service, N.C., 126-127
Agricultural Systems Technology curriculum, 98-99
Agriculture and Life Sciences, College of, 79-129; courses, 318
Agronomy curriculum, 87-89
Air Force ROTC, 284-285
Alexander International Program, 31-32
Alpha Lambda Delta, (*See* academic honors)
Alumni Association, NCSU, 301, 303
Anatomy, Physiological Sciences and Radiology Department, 280
Animal Science Department, 93-96; courses, 319-321; minor, 96
Anthropology Concentration in Sociology, 242; courses, 321-322; minor, 243
Apparel Management concentration in Textile and Apparel Management, 276-277
Applied Mathematics option in Mathematics, 256-257
Architecture curriculum (fifth year), 134
Architecture Department, 132-134; courses, 323-325
Army ROTC, 282-284
Artist-in-Residence, 71
Arts Studies course list, 22-23; minor, 220-221
Aseptic Processing and Packaging Studies, Center for, 293
Associate of the Textile Institute (ATI) Diploma, 264
Athletic Grants-In-Aid, 47
Athletics, Intercollegiate, 73
Athletics, Intramural-Recreational, 74
Audits (Undergraduate), 64

B

Basic Educational Opportunity Grant, (*See* Pell Grant)
Benjamin Franklin Scholars Program, 222
Biochemistry Department, 96-97; courses, 329-330
Biological and Agricultural Engineering Department; 97-99, 170-171; courses, 326-329
Biological Sciences, courses, 332; curriculum, 99-101
Biology Field Laboratory, 292
Biomathematics courses, 330
Biosciences option in Chemical Engineering, 173-174
Board of Governors of The UNC System, 494
Board of Trustees, NCSU, 502
Board of Trustees of the Endowment Fund of NCSU, 300
Bookstores, 68
Botany Department, 101-103; courses, 330-331; minor, 103
Broadcast Services, Office of, 302
Business Management, courses, 357-359; curriculum, 228; minor, 228

C

Caldwell, John T., Alumni Scholarship, 25
Calendar, academic, 11-14
Career Planning and Placement Center, 66
Certificate programs, non-degree, 27
Chemical Engineering Department, 171-174; courses, 339-341
Chemical Engineering concentration in Pulp and Paper Science and Technology, 214-215Chemistry Department, 246-248; courses, 337-339
Chinese Language and Literature courses, 382
Civil Engineering Department, 174-178; courses, 332-336
Classical Studies minor, 232
Classification of students, 51-52
Clothesline Program, 68
Clubs and societies, 69
Code of Conduct, 65
Cognitive Science minor, 161, 238
College, Departments, and Programs of Study, 75-281; (*See also* specific college)
College Level Examination Program (CLEP), 38-39
Communication concentration in Conservation, 203
Communication Department, 223-224; courses, 341-346
Communications and Signal Processing, Center for, 293
Companion Animal and Special Species Medicine Department, 280
Comparative Literature, courses, 346; minor in, 231
Computer Engineering curriculum, 183-184
Computer Programming, minor, 180
Computer Science Department, 179-180; courses 348-352
Computers, purchased by students in Engineering, 168
Computing, University, 291
Conservation curricula, 103-104, 201-203
Construction Management curriculum, 177-178
Construction option in Civil Engineering, 177
Continuing Education and Professional Development, Office of, 288
Cooperative Education Program, 26-27; fees for, 42; in engineering, 169; in humanities and social sciences, 222; in textiles, 265
Cooperating Raleigh Colleges, 29
Coordinators of advising, 51
Counseling, 66
Counselor Education courses, 362
Course descriptions, 314

Course load, semester, 52
Course Repeat Policy, 62
Course prefixes, 314-315
Crafts Center, 72
Credit by Examination, 63
Credit by examination through Independent Study, 63-64
Credit-Only Option for free elective courses, 64
Criminal Justice option in Political Science and Public Administration, 240
Criminal Justice option in Sociology, 242
Crop Science Department, 104-105; courses, 346-348
Curricula in Agriculture and Life Sciences, general requirements, 82-87
Curriculum and Instruction courses, 367-369
Curriculum Materials Center, 290-291

D

Dairy Foundation, Inc., N.C., 300
Dairy Science, 105
Dean's List, 55
Degrees: graduate, 20-21; in agriculture and life sciences, 81; professional, 20, (in engineering), 168, 197-198; undergraduate, 18-19
Design Department, 130-132; courses, 353-355; minor, 131-132
Design Foundation, Inc., NCSU School of, 301
Design Fundamentals courses, 352
Design, School of, 129-138
Dropping and Adding Courses, 40
Dyeing and Finishing Management concentration in Textile Chemistry, 267
Dyeing and Finishing Operations concentration in Textile Chemistry, 268
Dyeing and Finishing Science concentration in Textile Chemistry, 269

E

Economics, courses, 359-362; minor, 229
Economics and Business Department, 227-229
Economics and Business, Division of, 225-229; residency requirements for, 226
Education and Psychology, College of, 138-165
Education courses, 369
Education, General Studies, 144-145
Educational Leadership and Program Evaluation courses, 369-370
Electric Power Research Center, 294
Electrical and Computer Engineering Department, 181-184; courses, 363
Electron Microscope Facilities, 294-295
Eli Whitney Double Degree Program in Textiles and International Studies, 223
Emergency short-term loans, 48
Emerging Issues Forum, 289
Employment Service, Student, 48
Engineering courses, 355-367
Engineering Foundation, Inc., N.C., 300
Engineering Scholars Program, 169
Engineering, College of, 166-198; computing fee, 42; transfer program, 167
English Department, 229-231; courses, 371-376; minors, 231
English for Foreign Students courses, 382-383
English Teacher Education option, 145
Entomology Department, 106; concentration, 101; courses, 377
Environmental Design curriculum, 131
Environmental Education concentration in Conservation, 203
Environmental Science minor, 235
Environmental Technology concentration in Conservation, 202
Evening undergraduate degree programs, 27
Expenses, estimated, 41-43
Extension and Public Service, University, 287-290

F

Faculty advisers, responsibilities of, 50-51
Faculty and other academic personnel, 503-553
Faculty Scholarships for Juniors and Seniors, University, 25
Film Studies minor, 224
Financial Aid, 46-48
First Year Experience, 28
Fisheries and Wildlife Sciences (*See also* Department of Zoology); 106, 124-126; courses, 395-396
Folger Institute, 223
Food Animal and Equine Medicine Department, 280
Food Science Department, 107-109; courses, 393-394; minor, 109
Food Service, 66
Foreign Languages and Literatures Department, 231-233; courses, 381-382; minors, 232-233
Forest Management minor, 208-209
Forest Resource Extension program, 200
Forest Resources, College of, 199-217; courses, 336-337
Forestry Department, 203-209; courses, 390-393; curricula for transfer students, 206-208
Forestry Foundation, Inc., N.C., 300
Four-One Program in Textiles, 263
Fraternities, 50, 69
French Language and Literature courses, 383-384
French Teacher Education option, 145, 232
Freshman Admission, 35-36
Furniture Manufacturing and Management curriculum, 186-187

G

General Administration of The UNC System, 493
General education distribution requirements, 75-76
Genetics Department, 109; courses, 397; minor, 109
Geology curriculum, 251-253; minor, 252-253
Geophysics option in Geology, 253
German Language and Literature courses, 384-385
Grade point average, 54
Grade reports, 55-56
Grading system, 53-54
Graduate School, 286
Graduate Students, admission requirements for, 39; housing, 49
Graduation Requirements, 76-77
Graduation with honors, 55
Grants, (*See also*, scholarships) 47
Graphic Communications, courses, 396-397; minor, 145
Greek Language and Literature courses, 398
Guaranteed Student Loans, (*See* Robert T. Stafford Loan Program), 47

H

Handicapped Students, 66-67
Health, 67
Health Occupations Teacher Education curriculum, 146-147
Hebrew Language and Literature courses, 385, 463
Highlands Biological Station, 295-296
Hill Library, D.H., (*See also* Libraries, University), 290
Historical sketch, NCSU, 495-496
History Department, 233-234; courses, 399-406; minor, 234

History of Art courses, 398-399
Honorary societies, 55, 69, 80, 200, 264
Honors and Scholars Programs, 23-24
Honors designation in undergraduate degrees, 55
Honors Programs in agriculture and life sciences, 80; in forest resources, 200; in humanities and social sciences, 221; in mathematics, 255; in philosophy, 236; in religious studies, 236-237; in textiles, 263-264
Horticultural Science Department, 110-112; courses, 406-408; minor, 112
Housing for students with families, 49
Human Resource Development option in Psychology, 161-163
Humanities and Social Sciences, College of, 217-243; courses, 408-409
Humanities Foundation, Inc., NCSU, 301

I

Illegal Drugs Policy, 499-501
Immunization, required documentation, 39
Independent Study, credit by examination through, 63-64
Individualized Study Program, 112
Industrial and Technical Education Program, 147-149
Industrial Engineering Department, 184-186; courses, 409-413; minor, 186
Information Services, Office of, 302
Institute of Statistics, 296
Institutional loans, 47
Instructional Telecommunications, 289
Insurance, accident and health, 65
Insured Student Loan Programs, 47-48
Integrated Manufacturing Systems Engineering Institute, 296
Interinstitutional registration, 40
International Student Exchange Program, 33
International programs and activities, 30-34
International students, 30-31
International Studies, concentration: Humanities and Social Sciences, 220; minor, 220; option: agriculture and life sciences, 81
International Trade Center, 289
Intra-campus transfers, 61, 65
Intramural-recreational sports, 74
Italian Language and Literature courses, 386

J

Japan Center, (*See* North Carolina Japan Center)
Japanese Language and Literature courses, 386-391
Jefferson Scholars in Agriculture and the Humanities, 81, 222
Journalism minor, 231

K

King Village, E.S., (*See* Housing for students with families)

L

Laboratory and computer course fees, 42-43
Landscape Architecture Department, 134-135; courses, 413
Latin Language and Literature courses, 414
Laundry and Dry Cleaning, 67
Law and Political Philosophy concentration, 240
Leadership training, 72-73
Libraries, University, 290-291
Lifelong Education students, admission requirements, 38
Linen Rental Program, 67
Linguistics minor, 231
Loans, 47-48

M

Marine, Earth, and Atmospheric Sciences Department, 249-254; courses, 430-436
Marketing Education for Teachers curriculum, 149-150
Married student housing, (*See* Housing for students with families)
Mars Mission Research Center, 296
Materials Research Center, 296-297
Materials Science and Engineering Department, 187-189; courses, 424-426; minor, 189
Mathematics and Science Education Department, 151-154; courses, 370-371
Mathematics Department, 254-257; courses, 414-418; minor, 257
Mathematics Education curriculum, 151-152
McKimmon Center for Extension and Continuing Education, Jane S., 289-290
Mechanical and Aerospace Engineering Department, 190-193; courses, 419-423
Media, student, 70
Medical Technology curriculum, 112, 123-124
Merit Awards Program for entering Freshmen, 24-25
Meteorology curriculum, 253-254; courses, 434; minor, 254
Microbiology Department, 113; courses, 427; option, 101
Microbiology, Pathology, and Parasitology Department, 281
Microelectronics Center of North Carolina, 297
Middle Grades Education curricula, 154-159
Military Education and Training, 282-286
Military personnel, effect on residence status, 44
Military Science Department (Army ROTC), 282-284; courses, 436
Minority Presence Grants, 47
Minors, academic (*See also* specific departments), 17, 77
Multidisciplinary Studies Department, 234-236; courses, 427-430
Music Department, 282; courses, 436-438
Musical organizations, 70-71

N

N.C. 4-H Development Fund, Inc., N.C., 301
N.C. Student Incentive Grant, 47
N.C.S. Pipes and Drums, 71
National Direct Student Loans (*See* Perkins Loans)
National Student Exchange Program, 29-30
Natural Resources curricula, 21-22
Natural Resources Management and Administration concentration in Conservation, 202
Naval Science (Naval ROTC) Cross-Enrollment with UNC-CH, 285-286; courses, 440-441
Need-based scholarships for freshmen and continuing students, 46
Non-degree certificate programs, 27
Nondiscrimination Policy, 7
North Carolina Japan Center, 297
North Carolina State Fellows Program, 30
North Carolina State University, 5-7, 495-498
North Carolina State University Education Foundation, Inc., 301
North Carolina State University Foundation, Inc., 301
Nuclear Engineering Department, 193-195; courses, 438-440
Nuclear Laboratory, Triangle Universities, 299
Nuclear Services Division, 297-298
Nutrition concentration, 101; courses, 441; minor, 101

O

Oceanography (*See* Marine, Earth, and Atmospheric Sciences Department)
Occupational Education courses 378-381
Occupational Education, Center for, 293
Off-campus housing, 49
Operations Research courses, 441-442
Orientation, 39
Out-of-state students, 37

P

Parents' Association, NCSU, 301
Parks, Recreation and Tourism Management curriculum, 209-211; minor, 211
Peer Mentor Program, 28-29
Pell Grants, 47
Perkins Loans (formerly National Direct Student Loans), 47
Pershing Rifles, 73
Pesticide Residue Research Laboratory, 298
Philosophy and Religion Department, 236-238; philosophy courses, 448-450; minor, 238; religion courses, 463
Philosophy of Law concentration in Philosophy, 237
Physical and Mathematical Sciences, Foundation, Inc., N.C., 300
Physical and Mathematical Sciences, College of, 244-261; courses, 451
Physical Education Department, 238-239; courses, 443-448; minor, (Coaching Emphasis), 239
Physics Department, 257-259; courses, 460-463; minor, 259
Physiology courses, 450
Phytotron, (*See* Southeastern Plant Environment Laboratory—Phytotron)
Plant Disease and Insect Clinic, 298
Plant Pathology Department, 113-114; courses, 453
Political Science and Public Administration Department, 239-240; courses, 453-457; minor, 240
Polymer Chemistry concentration in Textile Chemistry, 269-271
Portuguese Language and Literature courses, 387
Post-Baccalaureate (PBS), classification as, 52
Poultry Science Department, 114-116; courses, 451-453
Precision Engineering Center, 298
Pre-Law Program, 16, 221
Pre-Medical Sciences, 16-17, 116, 245
Pre-Professional Programs, 16-17, 120-121
Pre-Veterinary Program, 17; course requirements, 279-280
Probation, academic, 57
Product/Visual Design Department, 136-138; product design courses, 442-443; visual design courses, 485-486
Psychology Department, 159-163; courses, 458-460; minor, 161
Psychology: Human Resource Development option, 161-163
Public Administration courses, 442
Public Relations Committee, 302
Pulp and Paper Foundation, Inc., 302
Pulp and Paper Science and Technology curriculum, 212-215

R

Ranger Challenge Team, 73
Readmission of former or suspended degree students, 58-61
Recreation Resource Administration courses, 465-467
Refund Policy: residence hall, 49; tuition, 43
Registration, 40
Religion courses, 463-465
Religious Studies concentration in Philosophy, 237; minor, 238
Repeating courses, 62
Reproductive Physiology Research Laboratory, 299
Required fees, 43
Research and Development in Mathematics and Science Education, Center for, 294
Research centers and facilities, 292-300
Research Triangle, 291-292
Residence halls, 48-49
Residence requirements for graduation, 77
Residence status for tuition purposes, 43-45
Role and Mission of NCSU, 497-499
Royal Society of Arts, London, Silver Design Medal, 264
Russian Language and Literature courses, 388

S

Schedule changes—Drops and Adds, 40
Scholars and Honors Programs, 140, 169, 200, 222-223, 236-237, 245, 263-264
Scholarships, 24-26, 46, 47, 81, 140, 181-182, 194, 200, 213, 216, 221, 237, 260, 264-265
Scholastic Aptitude Test, 36
Science Education curriculum, 153-154
Science, Technology, and Society minor, 235-236
Scottish College of Textiles Exchange Program, 264
Sea Grant College Program, 299
Servicemen's Opportunity Colleges, 38
Social Studies Teacher Education curriculum, 163; option in History, 237; option in Political Science and Public Administration, 240; option in Sociology, 242
Social Work curriculum, 242-243; courses, 475-476; minor, 243
Sociology, Anthropology, and Social Work Department, 117-118, 241-243; courses, 467-471; minors, (applied sociology), 118, 243
Soil Conservation concentration in Conservation, 202
Soil Science Department, 119-120; courses, 471-473; minor, 120
Sororities, 50, 69
Sound and Vibration, Center for, 294
Southeastern Plant Environment Laboratory-Phytotron, 299
Spanish Language and Literature courses, 388-390
Spanish Teacher Education curriculum, 163; option, 232
Special academic programs, 26-30
Speech-Communication courses (*See* Communications)
Statistics Department, 259-261; courses, 473-475; minor, 261
Statistics, Institute of, 296
Stewart Theatre, 72
Student activities, 69-74
Student Center, University, 71
Student Government, 69
Student housing, 48-50
Student media, 70
Student services, 65-69
Students Supply Stores (*See* Bookstores)
Study, travel, and short-term employment abroad, 32-34
Summer Institute in English for Speakers of Other Languages, 31
Summer Sessions, 287
Summer study abroad programs, 33-34
Supplemental Educational Opportunity Grants, 47
Suspension policy, academic, 57
Swahili (Kiswahili) Language and Literature courses, 387

T

Teacher Education option in English, 230
Technology Education Program, 164-165; courses, 482-483; minor, 165
Textile and Apparel Management Department, 273-278; courses, 477-480
Textile Chemistry courses, 480-481; curricula, 267-271; minor, 271
Textile Design Concentration in Textiles, 273-274
Textile Engineering courses, 481-482; curriculum, 195-197
Textile Engineering, Chemistry, and Science Department, 266-272
Textile Foundation, Inc., N.C., 301
Textile Management concentration in Textile and Apparel Management, 277-278
Textile Scholar-In-Residence Program, 264
Textile Science courses, 483-484; curriculum, 271-272
Textile Technology concentration in Textiles, 275-276; courses, 484-485
Textiles, College of, 262-278; courses, 476-477
Theatre minor, 224
Theatre, Stewart, 72; Thompson Theatre, 72 (*See also* Arts Studies Program and Communication Department)
Tobacco Foundation, Inc., N.C., 301
TOEFL Test (Test of English as a Foreign Language), 31
Toxicology Department, 121; courses, 485
Transcripts of academic record, 78
Transfer credit, 61-62
Transfer students: admission requirements, 37-38; effect on residence status, 45; residence requirements for graduation, 77
Transportation, 68-69
Triangle Universities Nuclear Laboratory, 299
Tuition and fees, 41-45
Two degrees, 77-78; in engineering, 167; in foreign languages and business management, 232; in forestry, 202, 216; in humanities and social sciences, 223

U

Unclassified students, 51; admission requirements for, 38
Undergraduate degrees and degree options, (*See* Degrees, undergraduate)
Undergraduate minors, 17 (*See also* specific departments)
Undergraduate Studies (UGS): classification as, 51-52
Undergraduate Studies Tutorial Center, 28
University Development, 300-302
University Extension and Public Service, 287-290
University Faculty Scholarships for Juniors and Seniors, 25
University of North Carolina, The, 493
University Relations, 302
University Scholars Program, 23-24
University Studies (*See* Multidisciplinary Studies)
University Transition Program, 26
University Undesignated Program, 26
Urban Affairs and Community Services, Center for, 288

V

Valedictorian, salutatorian, and highest ranking scholar in a college, 55
Veterinary Medicine Foundation, Inc., N.C. 301
Veterinary Medicine, Pre-professional Program, 120-121
Veterinary Medicine, College of, 279-281; courses, 486
Visas, and passports for U.S. students, 32; international students, 30
Visual Design courses, 485-486
Vocational Industrial Education, 147-148

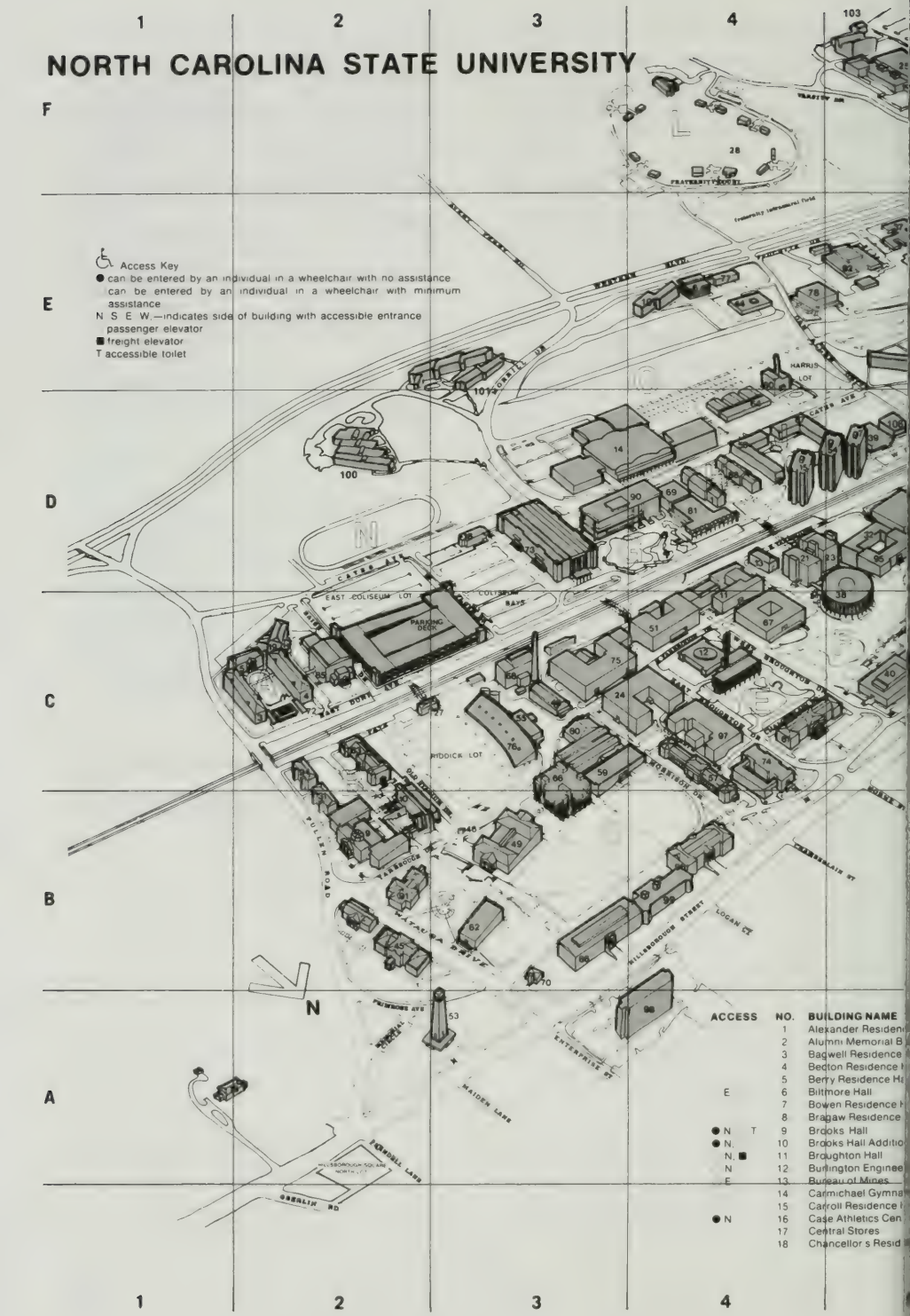
W

Water Resources Research Institute, 299-300
Withdrawal from the University, 58
Women's Studies minor, 236
Wood and Paper Science Department, 211-212; courses, 486-489
Wood Products minor, 217
Wood Science and Technology curriculum, 215-217
Work-Study Program, College, 48
Writing and Editing option in English, 230

Z

Zoology Department, 121-126; courses, 489-492; minor, 123

NORTH CAROLINA STATE UNIVERSITY



ACCESS	NO.	BUILDING NAME
	1	Alexander Residen
	2	Alumni Memorial B
	3	Bagwell Residence
	4	Becton Residence H
	5	Berry Residence Ha
E	6	Biltmore Hall
	7	Bowen Residence H
	8	Bragaw Residence
● N T	9	Brooks Hall
● N	10	Brooks Hall Additio
N ■	11	Broughton Hall
N	12	Burlington Enginee
E	13	Bureau of Mines
	14	Carmichael Gymna
	15	Carroll Residence H
● N	16	Case Athletics Cen
	17	Central Stores
	18	Chancellor s Resid

ACCESS	NO.	BUILDING NAME	GRID	CODE
○ E, ■	56	Nelson Textile Building	6-D	N
	57	1911 Building	4-C	
	58	Owen Residence Hall	4-D	
E	59	Page Hall	3-C	PA
W	60	Park Shops	3-C	PS
S	61	Patterson Hall	4-C	PT
● E	62	Peele Hall	3-B	
	63	Physical Plant Maint. Center	7-E	
	64	Physical Plant Shops (Armory)	4-D	
○ E	65	Phytotron	5-D	PHY
E,	66	Poe Hall	3-C	POE
● N,	67	Polk Hall	4-C	PK
	68	Power Plant	3-C	
○ S	69	Price Music Center	4-D	PMC
● W, T	70	Primrose Hall	3-B	
	71	Print Shop/University Graphics	6-E	
● E	72	Quad Snack Bar	2-C	
○ E, T	73	Wm. Neal Reynolds Coliseum	3-D	
E,	74	Ricks Hall	4-C	RI
N, ■	75	Riddick Engineering Labs	3-C	RD
	76	Riddick Stadium	3-C	
○ E	77	Robertson Wing, Biltmore Hall	4-E	
○ S, □	78	Schaub Food Science Building	4-E	SFS
○ S, ■	79	Scott Hall	5-D	SC
	80	Steam Plant	4-E	
E, ■	81	NCSU Bookstores	4-D	
	82	Sullivan Residence Hall	6-E	
	83	Syme Residence Hall	2-C	
	84	Television Center	6-F	TVS
○ E	85	Thompson Theater/Craft Center	2-C	TT
N, S	86	Tompkins Hall	3-B	T
	87	Tucker Residence Hall	4-D	
	88	Turlington Residence Hall	4-D	
	89	Turner House	6-C	
S, T	90	University Student Center	3-D	USC
	91	Watauga Hall	2-B	
W, ■	92	Weaver Laboratories	5-E	DSW
	93	Weed Control Laboratories	8-F	
	94	Welch Residence Hall	2-C	
S, ■	95	Williams Hall	5-D	WMS
N, S	96	Winston Hall	4-B	WN
E, ■	97	Withers Hall	4-C	WI
● E	98	North Residence Hall	3-A	
●S, T	99	Caldwell Hall	4-B	
●S,T	100	Weisiger-Brown Building (GAF)	2-D	
●E, T	101	Wood Residence Hall	3-D	
●E,T	102	Dining Hall	5-E	
●N,T	103	Solar Demonstration House	5-F	
	104	Administrative Services Center	6-E	
	105.	Research Facility (on Centennial Campus) (Not Shown)		
	106.	Pullen Hall		
	107.	Jorden Hall		

ACCESS	NO.	BUILDING NAME	GRID	CODE
● W, T	19	Clark Hall Infirmary	2-C	
○ S, ■	20	Clark Laboratories	5-D	CL
N,	21.	Cox Hall	4-D	COX
○ N, T	22	Cultural Center	5-D	
N	23	Dabney Hall	4-D	DAB
● W, ■	24	Daniels Hall	4-C	DAN
● W, □, T	25	McKimmon Extension Continuing Education Center	5-F	
	26	Farm Unit 5	6-F	
N	27	Field House	2-C	
	28	Fraternity Court	4-F	
○ S, ■	29	Gardner Hall	5-D	GA
● N, □, T	30	Bostian Hall	5-D	
	31	Gold Residence Hall	2-C	
	32	Williams Hall Addition	5-D	AGH
	33	Greenhouse—Biological Sciences	5-D	BSG
	34	Greenhouse—Horticulture	5-D	HGH
	35	Greenhouse—840 Method Rd	8-F	
	36	Greenhouse—Plant Pathology	5-D	PPG
E	37	Grinnells Animal Health Lab	5-E	GHL
○ N, □, T	38	Harrelson Hall	5-D	HA
● N, □, T	39	Harris Hall	5-D	
W,	40	D. H. Hill Library—Original Wing	5-C	DHL
W T	41	D. H. Hill Library—Book Stack Tower	5-C	
N, S,	42	D. H. Hill Library—Erdahl-Cloyd Wing North Campus Bookshop	5-C	
● N T	43	Hillsborough Building	5-C	HLB
W	44	Hodges Wood Products Lab	4-E	HWP
	45	Holladay Hall	2-B	
	46	Information Center, Visitor Parking	3-B	
S ■	47	Kilgore Hall	6-D	KI
	48	Laundry/Copy Center	3-C	
	49	Leazar Hall	3-B	LEZ
	50	Lee Residence Hall	5-E	
● S,	51	Mann Hall	4-C	MN
	52	E. S. King Village (17 Apt. Bldgs. A-Q)	7-F	
	53	Memorial Tower	3-A	
	54.	Metcalf Residence Hall	4-D	
● S	55	Morris Building	3-C	

COURTS AND FIELDS	GRID
A. Bagwell-Becton-Berry Quad	2-C
B. Gold-Welch-Syme-Brooks Court	2-C
C. Mary E. Yarbrough Court	3-B
D. Court of North Carolina	3-B
E. Gardner Arboretum	4-C
F. University Plaza (Brickyard)	5-C
G. University Student Center Plaza	4-D
H. Turlington-Alexander Court	4-D
J. Tucker-Owen Court	4-D
K. Lee-Sullivan-Bragaw Court	5-E
L. Fraternity Court	4-F
M. E. S. King Village Court	7-F
N. Paul H. Derr Track	2-D
O. Miller Fields	4-E
P. Doak Field	6-E
Q. McKimmon Center Court	5-F
R. The Big Acre	8-F
S. Tennis Courts	6-E

PARKING LOTS	GRID
Brooks Ave. Lot	6-C
Carmichael Lot	3-D
Coliseum Bays	3-D
East Coliseum Lot	2-C
Friendly Drive Lot	6-D
Harris Lot	4-E
Hillsborough Building Lots	6-C
Parking Deck	2-C
Riddick Lot	3-C
Sullivan Lots	6-E
West Lot	6-E
Additional West Lot Parking	5-E
Yarbrough Lot	3-C
Hillsborough Square North	2-A

6 7 8 9

North Carolina State University Bulletin
Office of Undergraduate Admissions
Box 7103
Raleigh, N.C. 27695-7103

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CORRECTED COPY

1991 Spring Commencement

North Carolina State University

Saturday, May 11
Nineteen Hundred and Ninety-One
Degrees Awarded 1990-91

DEGREES CONFERRED

Saturday, May 11
Nineteen Hundred and Ninety-One
Degrees Awarded 1990-91

This program is prepared for informational purposes only. The appearance of an individual's name does not constitute the University's acknowledgement, certification, or representation that the individual has fulfilled the requirements for a degree.

Honors listed for May 1991 candidates for degree are tentative in that they are calculated without the final semester grades.

TABLE OF CONTENTS

Musical Program iv

Mr. William C. Friday v

The Alma Mater vii

Exercises of Graduation viii

Commencement Ushers ix

Commencement Marshals ix

Faculty Retirements 1990-91 x

Time and Location of Distribution of Diplomas xi

ROTC Commissioning Ceremony xiii

Academic Costume xiv

Academic Honors xiv

Undergraduate Degrees 1

Graduate Degrees 46

- Master's Degrees 46
- Master of Arts Degrees 50
- Master of Science Degrees 50
- Doctor of Education Degrees 55
- Doctor of Philosophy Degrees 56

Alumni Distinguished Professors 135

Outstanding Teacher Awards for 1990-91 136

Awards for Achievement—1990-91 137

Army ROTC Commissionees—1990-91 146

Navy ROTC Commissionees—1990-91 146

Air Force ROTC Commissionees—1990-91 147

1991 Commencement Acknowledgements 148

Musical Program

EXERCISES OF GRADUATION

May 11, 1991

Commencement Band Concert: 8:30 a.m.
Carter-Finley Stadium

The Royal Fireworks Music ..... George Frederic Handel
Overture

The Sound of Music ..... Richard Rodgers/Oscar Hammerstein
Arranged by Robert Russell Bennett

Stars and Stripes Forever ..... John Philip Sousa

"Finale" from the New World Symphony ..... Antonin Dvorak

America the Beautiful ..... Samuel Ward/Carmen Dragon

PROCESSIONAL: 9:00 A.M.

March Processional ..... Clare Grundman

RECESSIONAL: (Platform Party Only)

University Grand March ..... Edwin Franko Goldman

NORTH CAROLINA STATE UNIVERSITY COMMENCEMENT BAND
Dr. Ronald J. Toering, Conductor

WILLIAM C. FRIDAY

Fifty years ago, William C. Friday, class president, stood at the podium and addressed his fellow graduates of North Carolina State College's Class of 1941. He urged them to "keep State College constantly in your mind. . . You and I are going to be held responsible in a great measure for the growth and progress of the institution."

William Friday went a step further, however, and for the following 50 years has been an outstanding advocate not only for his alma mater, but for The University of North Carolina, and for American higher education.

While still a student, William Friday began turning heads. One journalist wrote prophetically in 1941, "This man Friday is a big operator. He hobnobs with North Carolina's main-line politicians and gives every indication of being a coming member of that select coterie.... He thinks nothing of running up to the Governor's office for a chat.... In recent weeks, with appropriations in mind, he has been buttonholing legislators to extoll State College and point to its needs. None close their minds to this friendly, frank-faced boy from Gaston."

It surprised few that by his 15th class reunion, Friday had been named president of the Consolidated University of North Carolina. At 36 years old in 1956, he was one of the youngest university presidents, and certainly was one of few who had ascended to such academic heights without previous top administrative experience, or an advanced academic degree, or any classroom teaching experience.

Thirty years later, when he retired as president of The University of North Carolina system in 1986, he had left a legacy of national admiration for the state's system of higher education. He had achieved that legacy not by heavy-handed autocracy, but by encouraging quiet cooperation and communication among his administrators.

Friday spent his boyhood in Dallas, N.C., where he was a debater, played baseball and wrote sports news for the Gastonia Gazette. He was president of his class each year in high school.

He entered Wake Forest College for one year and then transferred to North Carolina State College. At State he earned numerous awards, was sports editor of the *Technician* and president of the senior class. He earned a bachelor's degree in textile engineering with honors.

After service as an ensign in the U.S. Navy during World War II, he entered law school at the University of North Carolina, Chapel Hill, where he earned a degree in 1948. Shortly after, he married Ida Willa Howell of Lumberton.

Friday served as an assistant to Gordon Gray, president of the University of North Carolina, from 1951 to 1955. In 1956 he began his career as president—a career marked by smooth administrative leadership despite inevitable conflicts and controversies brought on by the system's growing pains.

During his tenure, the system grew from three institutions to 16, its annual budget rose from $40.7 million to $1.5 billion, and enrollment climbed from 14,971 to 125,000 students.

Meanwhile, Friday guided American higher education as well, serving as chairman of numerous national panels including the Carnegie Foundation for the Advancement of Teaching, the American Council on Education, President Johnson's

Task Force on Education, President Carter's Task Force on Education, the American Council on Education and the Knight Foundation National Commission on Intercollegiate Athletics.

In 1985 he received the American Council on Education's National Distinguished Service Award for Lifetime Achievement, and the following year was rated the most effective public university president in the nation by the Council of Advancement and Support of Education.

Through the years, Friday maintained first-hand contact with the people of North Carolina and hosted the television program "North Carolina People" for 19 years.

Friday continues his active role in academia as University Professor at the University of North Carolina at Chapel Hill.

William C. Friday delivering
student address in 1941.

The Alma Mater

Words by:
ALVIN M. FOUNTAIN, '23

Music by:
BONNIE F. NORRIS, JR., '23

Where the winds of Dixie softly blow
o'er the fields of Caroline,

There stands ever cherished N. C. State,
as thy honored shrine.

So lift your voices; Loudly sing
from hill to oceanside!

Our hearts ever hold you, N. C. State
in the folds of our love and pride.

Exercises of Graduation

Carter-Finley Stadium

Chancellor Larry K. Monteith
Presiding

May 11, 1991

PROCESSIONAL, 9:00 a.m. ..... Dr. Ronald J. Toering
Conductor, North Carolina State University Commencement Band

The audience is requested to remain seated during the Processional.

WELCOME ..... Chancellor Larry K. Monteith

INVOCATION ..... Reverend Dr. Gregory L. Edmond
Pastor, St. Paul AME Church
Raleigh, NC

NATIONAL ANTHEM ..... The Grains of Time

INTRODUCTIONS ..... Chancellor Monteith

GREETINGS ..... President C. D. Spangler, Jr.
The University of North Carolina

ADDRESS ..... Dr. William C. Friday

CONFERRING OF HONORARY DEGREES ..... Chancellor Monteith

Dr. William C. Friday	Doctor of Public Service
Dr. Nyle C. Brady	Doctor of Science

CONFERRING OF DEGREES ..... Chancellor Monteith

Candidates for Doctor of Veterinary Medicine presented by Dean of College of Veterinary Medicine. Candidates for other advanced degrees presented by Dean of Graduate School. Candidates for baccalaureate degrees presented by Deans of Colleges

ADDRESS TO FELLOW GRADUATES ..... Mr. Graham Boyd
Class of 1991

RECOGNITIONS ..... Chancellor Monteith

VALEDICTORIANS — CLASS OF 1991 .....

Dennis Hui	Dorothy O. Osborne
James Joseph Jetter	Edward Curtis Schatte
Adam Leonard Lyon	Chris Wilkins

Ellen Maria Williams

TURNING OF THE TASSEL ..... Mr. Graham Boyd

ALMA MATER ..... The Grains of Time

RECESSIONAL (Platform Party only)

Commencement Ushers

Army ROTC Ushers
Diane F. Carver
Yvette D. Boyajian
George M. Blair
Paul W. Pruden
Thomas A. R. Baker
Joseph E. Johnson
Brian G. Marlow
Stanley Holcomb
Bobby Cardenas
Richard Baucom
Chad Haley
James Hardaway

Navy ROTC Ushers
James C. Preddy
Richard L. Biggs
William S. Burns
David H. DeBoskey
Coley R. Myers, III
Douglas K. Manfredi
David W. Johnson
Raymond S. Allen
Jeffrey D. Wright
Gregory J. Harman
Michael W. Howell
Efrem R. Leach

Air Force ROTC Ushers
John Belk
Dean Bellamy
Roger Gonzales
Leland Heath
George Hobson
Dorinda Humphries
Jamie Law
James McMillan
William Palmer
Jason Roberts
Timothy Sands
Torrey Woodhouse

Commencement Marshals

Hasoni Lenore Andrews
Ann Howard Banzet
Gregory A. Bryant
Sarita Ami Chung
Robert Corbett
Sheldon Brant Davis
Janeen C. Deang
Amy Hester Duggins
Jennifer Brannon Fu
Julie Ann Gavaghan
Mark D. Geil
Pam Gibson
Kimberly Ann Hale
Marnie Kristen Hamer
Gina Ann Harris
Ronald Scott Jackson
Ronica Johnson
John Nicholas Kandara
Amie Koenig
Yen-Ling Lai
Kedrick Tyrone Lowery
Mark S. MacLean
Donnell Mitchell
L. Susan Moore
Andrew T. Mueller
Heather Lee Osborne
Alton Douglas Powell
Deepa Ramesh
Teresa Lynette Reid
Marti Revel
R. Leon Robinson
Jeffrey Scott Sagraves
Karen Annette Sauls
Jodi A. Schuh
Erik M. Singer
Julie C. Spaeth
Jeffrey D. Spitz
Kenneth E. Spruill, Jr.
Patrick Strader
Donnie A. Williams, Jr.
Jefferey T. Willits
Cynthia Eve Zuckerman

Faculty Retirements, 1990-91

Apple, Jay Lawrence, College of Agriculture and Life Sciences, will retire June 30, 1991.

Armstrong, Frank Bradley, Jr., College of Agriculture and Life Sciences, retired December 31, 1990.

Bentley, Peter John, College of Veterinary Medicine, will retire August 31, 1991.

Blum, George Benjamin, Jr., College of Agriculture and Life Sciences, will retire June 30, 1991.

Bowen, Henry Dittimus, College of Agriculture and Life Sciences, retired September 30, 1990.

Chamblee, Douglas Scales, College of Agriculture and Life Sciences, will retire June 30, 1991.

Clawson, Albert James, College of Agriculture and Life Sciences, will retire June 30, 1991.

Cockerham, Columbus Clark, College of Agriculture and Life Sciences and College of Physical and Mathematical Sciences, retired December 31, 1990.

Cummings, George August, College of Agriculture and Life Sciences, retired December 31, 1990.

Davis, Robert Lee, College of Agriculture and Life Sciences, retired March 31, 1991.

Emery, Donald Allen, College of Agriculture and Life Sciences, retired April 30, 1991.

Freedman, Leon David, College of Physical and Mathematical Sciences, will retire June 30, 1991.

Gross, Harry Douglass, College of Agriculture and Life Sciences, retired December 31, 1990.

Hall, George Lincoln, College of Physical and Mathematical Sciences, will retire June 30, 1991.

Hanson, Warren Durward, College of Agriculture and Life Sciences, retired December 31, 1990.

Hawkins, Leo Franklin, College of Agriculture and Life Sciences, retired October 31, 1990.

Hobgood, Thomas Newton, Jr., College of Agriculture and Life Sciences, will retire May 31, 1991.

Longmuir, Ian Stewart, College of Agriculture and Life Sciences, retired December 31, 1990.

Massey, Frances Wilson, College of Textiles, will retire May 15, 1991.

Moazed, Khosrow Louis, College of Engineering, retired December 31, 1990.

Pearson, Ronald Gray, College of Forest Resources, will retire June 30, 1991.

Reid, Elbert, College of Agriculture and Life Sciences, retired December 31, 1990.

Seagondollar, Lewis Worth, College of Physical and Mathematical Sciences, will retire June 30, 1991.

Simpson, William Hughes, Secretary of the University, retired September 30, 1990.

Sternloff, Robert Elmer, College of Forest Resources, will retire June 30, 1991.

Triantaphyllou, Anastasios Christos, College of Agriculture and Life Sciences, will retire June 30, 1991.

van der Vaart, Hubert Robert, College of Physical and Mathematical Sciences, will retire June 30, 1991.

Williams, Robert Travis, College of Education and Psychology, will retire June 30, 1991.

Winstead, Nash Nicks, Provost and Vice-Chancellor, retired September 1, 1990.

Time and Location for Distribution of Diplomas

College of Agriculture and Life Sciences—1:30 p.m.

Adult and Community College Education ... Room 1C-D, McKimmon Center, Western Boulevard

Agricultural Business Management and Agricultural Economics ..... Main Floor, Reynolds Coliseum

Agronomy, Crop Science, Soil Science and Conservation ..... 2215 and 2223 Williams Hall

Animal Science ..... Room 2, McKimmon Center

Biochemistry ..... Room 8, McKimmon Center

Biological and Agricultural Engineering ..... Weaver Laboratories Pavilion

Biological Sciences ..... 2722 Bostian Hall

- Biological Sciences Major
- Botany
- Ecology
- Entomology
- Genetics
- Microbiology
- Nutrition
- Plant Pathology
- Toxicology

Food Science ..... 105 Schaub, Food Science Building

Horticultural Science ..... NCSU Arboretum, Beryl Road (In case of rain, Room 159 Kilgore Hall)

Individualized Study Program ..... Location of Major Faculty Advisor

Physiology Program ..... Location of Major Advisor

Poultry Science ..... Baptist Student Center, 2702 Hillsborough Street

Applied Sociology ..... 218 Withers Hall

Zoology ..... 3712 Bostian Hall

- Fisheries and Wildlife Sciences
- Medical Technology
- Zoology Majors

School of Design—1:30 p.m. ..... Stewart Theatre

Reception—2:30 p.m. ..... Brooks Hall Courtyard

College of Education and Psychology

Administration and Supervision - 12:00 p.m. ..... 220 Poe Hall

Adult and Community College Education - 1:30 p.m. ..... Room 1C-D McKimmon Center, Western Boulevard

Counselor Education - 12:00 p.m. ..... 532 Poe Hall

Curriculum and Instruction, Special Education, and Middle Grades Education - 12:00 p.m. ..... South Wing, Dining Hall

Education General Studies - 12:00 p.m. ..... 220 Poe Hall

Mathematics and Science Education - 1:00 p.m. ..... 216 Poe Hall

Occupational Education: Agricultural Education, Health Occupations Education, Industrial Arts/Technology Education, Industrial and Technical Education, Marketing Education, Occupational Education and Training and Development - 12:00 p.m. ..... 216 Poe Hall

Psychology - 12:00 p.m. ..... North Wing, Dining Hall

College of Engineering - 1:30 p.m.

Biological and Agricultural Engineering ..... Weaver Laboratories Pavilion

Chemical Engineering ..... Thompson Theatre

Civil Engineering ..... Portico of Mann Hall

Computer Science ..... 240 Nelson Hall

Electrical and Computer Engineering ..... Governor Holshouser Building N.C. State Fairgrounds

Furniture Manufacturing and Management ..... Ballroom, Faculty Club

Industrial Engineering ..... Ballroom, Faculty Club

Integrated Manufacturing Systems
Engineering ..... Walnut Room, University Student Center
Master of Engineering ..... Walnut Room, University Student Center
Materials Science and Engineering ..... McKimmon Center
Mechanical and Aerospace
Engineering ..... University Student Center Ballroom
Nuclear Engineering .. North Portico, Burlington Engineering Laboratories

College of Forest Resources—1:30 p.m. ..... Area 1 A and B, McKimmon Center, Western Boulevard

College of Humanities and Social Sciences—1:30 p.m.
Accounting ..... Martin Middle School Auditorium, 1701 Ridge Road
Business Management and Economics ..... Main Floor, Reynolds Coliseum
History ..... 100 Harrelson Hall
English ..... West Raleigh Presbyterian Church, 27 Horne St.
Foreign Languages and Literatures ..... West Raleigh Presbyterian Church, 27 Horne St.
Multi-Disciplinary Studies ..... West Raleigh Presbyterian Church, 27 Horne St.
Philosophy and Religion ... West Raleigh Presbyterian Church, 27 Horne St.
Political Science ..... Caldwell Hall Patio (Rain: Caldwell Hall Lobby)
Sociology, Anthropology and Social Work ..... 218 Withers Hall
Communication ..... Carmichael Gymnasium

College of Physical and Mathematical Sciences - 1:30 p.m.
Chemistry ..... 124 Dabney Hall
Mathematics ..... 222 Dabney Hall
Physics ..... 206 Cox Hall
Statistics ..... Erdahl-Cloyd Wing, D.H. Hill Library Room 2320
Marine, Earth and Atmospheric Sciences ..... 2010 Biltmore Hall

College of Textiles—1:30 p.m. ..... Forest Hills Baptist Church 3110 Clark Avenue

ROTC COMMISSIONING CEREMONY

MAJOR PHILIP D. RIDDLE
Presiding

Stewart Theatre
May 11, 1991

PROCESSIONAL MARCH, 4:00 p.m. ..... Dr. Ronald J. Toering
Conductor, North Carolina State University Commencement Band

NATIONAL ANTHEM

INVOCATION ..... Colonel Aubrey McLellan
State Chaplain, NCARNG

INTRODUCTIONS ..... Major Philip D. Riddle

WELCOME ..... Dr. Larry K. Monteith
Chancellor, North Carolina State University

INTRODUCTION OF GUEST SPEAKER ..... Major Philip D. Riddle

ADDRESS ..... Major General Nathaniel H. Robb, Jr.
Adjutant General NCARNG

ADMINISTRATION OF THE OATH
OF OFFICE ..... Major Philip D. Riddle
Acting Professor of Military Science
Colonel G. H. Walls
Professor of Naval Science
Colonel James T. Ferrell
Professor of Aerospace Studies

PRESENTATION OF CERTIFICATES ..... Dr. Larry K. Monteith

BENEDICTION ..... Colonel Aubrey McLellan

RECESSIONAL ..... Dr. Ronald J. Toering
The audience is requested to remain seated until the Recessional music is completed.

Academic Costume

Academic gowns represent a tradition handed down from the universities of the Middle Ages. These institutions were founded by the Church; the students, being clerics, were obliged to wear the prescribed gowns at all times. Round caps later became square mortarboards; the hoods, originally cowls attached to the gowns, could be slipped over the head for warmth.

Many European universities have distinctive caps and gowns which are different from those commonly used in this country. Some of the gowns are of bright colors and some are embellished with fur. A number of these may be noted in the procession.

The usual color for academic gowns in the United States is black. The bachelor's gown is worn closed, the master's and doctor's may be worn open or closed. The shape of the sleeve is the distinguishing mark of the gown: bachelor—long pointed sleeves; master—oblong, square cut in the back with an arc cut away in front; doctor—bell shaped.

Caps are black. The tassels for the Ph.D. degree are gold and those for other graduate and professional degrees may be of the color corresponding to the trimmings on the hoods.

Of all the components of the academic costume, the hood bears the heaviest symbolic burden. The hood must make clear the level of the degree, the faculty in which it was given, and the institution which awarded it. The level of the degree is shown by the size of the hood, the width of the velvet trimming, and in the case of doctors, by the shape. The bachelor's, master's, and doctor's hoods are three feet, three and one-half feet, and four feet long, respectively. The velvet trimming in the same order is two, three, and five inches and extends all around the hood on the exposed edge. This same trimming identifies the faculty in which the degree was awarded. For each faculty there is a corresponding color; so a glance at the trimming is all that is needed to identify the faculty. A *partial* list of the colors follows: Agriculture, maize; Architecture and Art, brown; Science, golden yellow; Economics, copper; Education, light blue; Engineering, orange; Forestry, russet; Physical Education, sage green; Religion, scarlet; Speech, silver gray; Veterinary Medicine, gray; Textiles, wine red. The following faculties have the same color—dark blue: Anthropology, History, Languages, Literature, Philosophy, Political Science, Sociology.

Academic Honors

Honors participants benefit from a more individualized and rigorous approach to their desired degree through special classes, seminars and individual research.

Undergraduate degree honor designations are:

Cum Laude—for GPA 3.250 through 3.499
Magna Cum Laude—for GPA 3.500 through 3.749
Summa Cum Laude—for GPA 3.750 and above.

UNDERGRADUATE DEGREES

College of Agriculture and Life Sciences

BACHELOR OF SCIENCE IN BIOLOGICAL AND AGRICULTURAL ENGINEERING

Jointly administered by the College of Agriculture and Life Sciences and the College of Engineering.

Degrees Conferred May 11, 1991

Amsey Ashbell Boyd, Jr. ..... Hamlet
Douglas Richard Cowan ..... Littleton
**Stephen Lonnie Crawford ..... Franklin
Anders Sture Johansson ..... Salisbury
Steven Eric Lawing ..... Charlotte
William Shannon Peede ..... Ayden

BACHELOR OF SCIENCE IN CONSERVATION

Jointly administered by the College of Agriculture and Life Sciences and the College of Forest Resources.

Degrees Conferred May 11, 1991

Edward Brent Bogue ..... Statonsburg
James Paul Jones II ..... Pine Level
Abigail Harwell Odeneal ..... West Palm Beach, FL
Brooke Alison Vickory ..... Lebanon, NJ

BACHELOR OF SCIENCE IN AGRICULTURAL BUSINESS MANAGEMENT

Degrees Conferred May 11, 1991

Samuel Graham Boyd ..... Pinetown
†Robert Norman Brown ..... Raleigh
Christopher Wayne Grimes ..... Roper
**Joan Osmond Little ..... Raleigh
Vernon Lee Miles ..... Mebane
Richard Hosea White, Jr. ..... Whiteville

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF SCIENCE IN AGRICULTURAL ECONOMICS

Degree Conferred May 11, 1991

***Herbert Giovanni Leusch-Carnaroli ..... Milano, Italy

BACHELOR OF SCIENCE IN AGRONOMY

Degrees Conferred May 11, 1991

Leslie Gerald Bailey ..... Robbins
H**Troy Eugene Coggins ..... Denton
Robert Lee Earley ..... Granite Falls
*Giulio Giovanni Ferruzzi ..... Beaufort
Richard Todd Lawrence ..... Angier
Cheatham Donald Lunsford, Jr. ..... Durham
*Paul Gregory McKenzie ..... Greensboro
Jody Don Reece ..... High Point
Gerald Timothy West ..... Kinston

BACHELOR OF SCIENCE IN ANIMAL SCIENCE

Degrees Conferred May 11, 1991

**Stephanie Joy Anderson ..... Whitakers
*Stephanie Verlyn Baker ..... Mount Olive
*Stephen Duane Blanton ..... Wilmington
H*Lisa Gay Britt ..... Goldsboro
H*Dawn Jennifer Bush ..... Currituck County
H***Christine Jo Campbell ..... Lewisville
**Staci Hope Canterberry ..... Cary
H**Kristen Carol Casulli ..... Flanders, NJ
**Candice Alene Corriher ..... Landis
Kimberly Woods Dunnagan ..... Hurdle Mills
***Matthew Wayne Ehinger ..... Stedman
Gina Marie Elias ..... Greensboro
Tonya Louise Flinchum ..... Statesville
William Brian Fouts ..... Franklin
Lisa Gay Goodman ..... New Bern
Roberta Nunnamaker Haskins ..... Durham
**Kenneth Lee Howe, Jr. ..... Gastonia
*Shannon Rene Howell ..... Apex
*Crystal Lynn Johnson ..... Roanoke Rapids
†John Andrew Justice ..... Southport
**Lucille Kohut ..... Scotch Plains, NJ
Karen Jean Kornegay ..... Mount Olive
**Lisa Lynn Lipps ..... Garner
**Elisa Dean Long ..... Huntersville
Elizabeth Castet Mason ..... Wilson
Amy Elizabeth Mauser ..... Claremont
*Marjorie Anne Moody ..... Raleigh
Kelly Lyn Morgan ..... Salisbury
Karen Elizabeth Pegram ..... Kernersville
*Scott Allen Rountree ..... Sunbury
*Christine Lynn Schwartz ..... Raleigh
Jenny Ann Van Houten ..... Hendersonville

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF SCIENCE IN APPLIED SOCIOLOGY

Degrees Conferred May 11, 1991

†Antonio Isaac-Monteiro ..... Bissau, Guinea
Herbert John Sullivan ..... Jacksonville

BACHELOR OF SCIENCE IN BIOCHEMISTRY

Degrees Conferred May 11, 1991

†Dana Alyce Baker ..... Raleigh
†**Edith Elena Beadles-Hay ..... Durham
*Christopher Stan Cameron ..... Sanford
†Steven Claude Cardon ..... Raleigh
†Michael George Carrico ..... Fairfax, VA
*Jennifer Elizabeth Culler ..... Fayetteville
Patricia Ann Dahill ..... Graham
†Jennifer Renee Elliott ..... Durham
H†***Michael Kevin Gibson ..... Damascus, MD
H***Sherrie Lea Gore ..... High Point
Dorian Travis Henderson ..... Greensboro
†**Stacey Todd Long ..... Prospect Hill
†**Cynthia Lyn Lowry ..... Raleigh
†**Karen Hodges Martin ..... Garner
H***Ingrid Joanna Massey ..... Charlotte
Robert Hopkins Maynard ..... Greensboro
H**Jennifer Hanna Peet ..... High Point
H***Stephen Lee Perkins ..... Lillington
†*Sonia Rahman ..... Winston-Salem
H†***Edward Curtis Schatte ..... Garner
*Douglas Todd Shuping ..... Salisbury
†Cyrus John Stacey ..... Washington, DC
*Marc Stern ..... Raleigh
***Kristi Lea Styers ..... Aberdeen
†*William Fletcher Talbot ..... Raleigh
H***James Eric Turner ..... Norwood
H†***Ellen Maria Williams ..... Staley
H***Victoria Marie Zula ..... State College, PA

BACHELOR OF SCIENCE IN BIOLOGICAL AND AGRICULTURAL ENGINEERING TECHNOLOGY

Degrees Conferred May 11, 1991

**George Shelton Lewis, Jr. ..... Dudley
Stephen Jay Roach ..... Hayesville

BACHELOR OF SCIENCE IN BIOLOGICAL SCIENCES

Degrees Conferred May 11, 1991

†Robert Scott Bakal ..... Sunrise, FL
Valerie June Brannon ..... Mechanicsville, VA
†Michael George Carrico ..... Fairfax, VA
*Laurel Anne Collier ..... Angier
Jeffrey Thomas Cook ..... Charlotte
†***Joseph Kevin Craig ..... Apex
Katrina Noelle Davis ..... Hickory

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

†**Angela Jill Driver ..... Mocksville
*Chad Lane Hallyburton ..... Oak Ridge
Denise Lavon Harris ..... Charlotte
Melinda Ann Howard ..... Greensboro
Ann Stephanie Lenkiewicz ..... Wilmington, DE
Edwin Keith Lindsay ..... Winston-Salem
Kelly Jean Maguire ..... E. Windsor, NJ
Marvin Lee Moss, Jr. ..... Williamston
*Perry Vincent Nelson ..... Raleigh
Robert Martin Phelps ..... Williamston
Mary Frances Poteet ..... Morganton
Maryam Sabir Rashidi ..... AFGHANISTAN
Karen Lynn Rice ..... Webster
Stacy Lynn Scarfutti ..... Natrona Heights, PA
*William James St Clair ..... Raleigh
Lori Kay Strum ..... New Bern
Fayette Quarles Thackston ..... Charlotte

BACHELOR OF SCIENCE IN BIOLOGICAL SCIENCES (Microbiology)

Degrees Conferred May 11, 1991

†Dana Alyce Baker ..... Raleigh
†**Edith Elena Beadles-Hay ..... Durham
*Melissa Ann Crider ..... Statesville
**Matthew Gray Davenport ..... Durham
H†***Michael Kevin Gibson ..... Damascus, MD
H**Annette Marie Hendricks ..... Mt. Airy
†**Stacey Todd Long ..... Prospect Hill
†**Karen Hodges Martin ..... Garner
*Daniel Robert McClernon ..... Durham
H***Kathy Good Meyer ..... Harrisonburg, VA
*Timothy Christopher Miller ..... Fayetteville
†***Edward Curtis Schatte ..... Garner
Tracy Edmund Thompson ..... Raleigh
**Sean Patrick Troth ..... Indianapolis, IN
H**Cynthia Leigh Warner ..... Raleigh
H†***Robert Christopher Wilkins ..... Sterling, VA
*James Daniel Yoakum ..... Muncie, IN

BACHELOR OF SCIENCE IN BOTANY

Degrees Conferred May 11, 1991

Deanna Lynne Little ..... Harrisonburg, VA
H***Milo Pyne ..... Durham
Sandra Lee Kuchta Rathjen ..... Norlina
Michael David Weinstein ..... Great Falls, VA

BACHELOR OF SCIENCE IN FISHERIES AND WILDLIFE SCIENCES

Degrees Conferred May 11, 1991

Mitchell Gray Faircloth ..... Winston-Salem
William Perry Horner ..... Sanford
***David Gregg McHenry ..... Denton
*Brian Hamilton Reise ..... Hillsborough
Ronnie Dale Stanley II ..... Pfafftown
Elijah Waters V ..... Casar

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF SCIENCE IN FOOD SCIENCE

Degrees Conferred May 11, 1991

Allen Winthrop Ames ..... Horseheads, NY
Terry Denise Caviness ..... Lakeview
John Joseph DeLuca ..... Smithtown, NY
**Ginger Dare Goodman ..... Salisbury
Maya Margaret Kryger ..... Lakeland, FL
Oscar Arturo Lizarazu ..... Cali Colombia, SA
†**Keith Eric Petrofsky ..... St. Louis, MO
Letitia Rochelle Strowbridge ..... Goldsboro
Laura Lee Willson ..... Charlotte

BACHELOR OF SCIENCE IN HORTICULTURAL SCIENCE

Degrees Conferred May 11, 1991

†Robert Norman Brown ..... Raleigh
Teresa Jean Bunch ..... Edenton
***Albert Roland Cooke, Jr. ..... Pittsboro
H Emile Louis Gebel, Jr. ..... Shelby
**Jody Reynolds Harris ..... Goldston
Harold Wade Huntley, Jr. ..... Monroe
H Andrea Kelly Hutchens ..... Winchester, NY
Albert Franklin Hyman, Jr. ..... Beaufort, SC
Donald Wayne Long ..... Ash
Patricia Marie Luhmann ..... Elkin
Christopher Paul Niewoehner ..... Raleigh
Paul Brian O'Connor ..... Basking Ridge, NJ
William Thomas Peace, Jr. ..... Forest City
Gary Lynn Pierce ..... Gatesville
*Katherine Jean Pue ..... Raleigh
*Timothy Charles Steinman ..... Salisbury
William Clayton Warren ..... Robersonville
Tonya Lynn Wilson ..... Cooleemee
Mickey Brian Wynne ..... Stokes

BACHELOR OF SCIENCE IN INDIVIDUALIZED STUDY PROGRAM

Degree Conferred May 11, 1991

†*Edward Dale McDaniel ..... Raleigh

BACHELOR OF SCIENCE IN MEDICAL TECHNOLOGY

Degree Conferred May 11, 1991

Ki Young Kim ..... SEOUL, KOREA

BACHELOR OF SCIENCE IN POULTRY SCIENCE

Degrees Conferred May 11, 1991

Terry Eugene Adams ..... Providence
H Derek Dolan Baucom ..... Monroe
†Fred Faragalla ..... Raleigh
Lisa Marie Foyles ..... Kinston
†John Andrew Justice ..... Southport
David Jackson Wright ..... Kannapolis

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF SCIENCE IN ZOOLOGY

Degrees Conferred May 11, 1991

H*Patricia Ozavize Adeleke ..... Raleigh
Helen Kay Andrews ..... Goldsboro
**Joel Evan Backer ..... Richmond, VA
†Robert Scott Bakal ..... Sunrise, FL
David Elliott Ballowe ..... Mechanicsville, VA
Michelle Annette Barrett ..... Raleigh
*Carl Lee Bass III ..... Raleigh
*Steven Robert Bauer ..... Harrisburg
Connie Marie Becker ..... Knightdale
Tracy Love Boone ..... Burlington
Anya Anjelica Bostian ..... Kannapolis
*James Robert Brown ..... Elizabeth City
**Jocelyn Lorainne Carter ..... Raleigh
William Michael Collins ..... Merrimack, NH
***George Lee Coppit III ..... Heiderberg, GERMANY
Vanessa Sara Correa ..... Fayetteville
*Andrew Jared Creager ..... Bemus Point, NY
*Jacqueline Lia Cumings ..... Lumberton
*William Wesley Ellington ..... Raleigh
†James Albert Ervin, Jr. ..... Rocky Mount
David Lovell Fairbrother ..... Raleigh
***Paul Martin Frank ..... Rock Hill, SC
*Kevin Earl Franks ..... Raleigh
Amy Carol Frazier ..... Knightdale
Julie Diane Frederick ..... Seattle, WA
***Stephen Craig Futrell ..... Jacksonville
Medeva Ghee ..... South Hill, VA
*Julie Lynn Goffinet ..... Tell City, IN
*Philip Todd Gray ..... Cary
**Laura Lee Grier ..... Lincolnton
Scott Patrick Guice ..... Charlotte
H†***Kimberly Carol Hamm ..... Greensboro
Angela Renee Hammons ..... Louisburg
Heather Jeannette Harris ..... Elizabeth City
Maria Ann Hedden ..... Andrews
*David Ashley Hill ..... Fayetteville
**Kristine Elise Holoman ..... Raleigh
Thomas Steven Ivester ..... Aberdeen
*Sasha Ales Jennette ..... Kitty Hawk
Wilson O'Kelly Jewell ..... Wilmington
H***Lori Moore Langdon ..... New Hill
Carolyn Edith Larson ..... Raleigh
***John Alexander Latham ..... New Bern
*Laura Kathryn Lathan ..... Cary
**Allison Rene Mains ..... Fayetteville
Rona Ethel Marslin ..... Queens, NY
Ronda Lauricee Morgan ..... Roosevelt, NY
Andrew William Neal ..... Raleigh
Diana Luz Ordonez ..... Columbia, MD
*Norva Elaine Osborne ..... Davidson
Zahira Johanna Owen ..... Raleigh

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

**Cecilia Catherine Pairo ..... Wheaton, MD
Dionne Yahmise Palmer ..... Rocky Point
***Kevin Neil Pennington ..... Lenoir
***Matthew Franklin Peters ..... Morehead City
***Sylvia Piqueras ..... Raleigh
Carmen Marie Plummer ..... Concord
Catherine Michelle Plyler ..... Charlotte
Stephen Barry Popson ..... Durham
Monica Ahzel Price ..... Raleigh
H**Mark Timothy Ramsey ..... Rosman
***Mark Radford Rich ..... Fayetteville
H Elizabeth Ann Rinker ..... Burlington
Arthur Vanvleck Robinson ..... Towson, MD
Stephanie Ann Scott ..... Knoxville, TN
Julie Lynn Shenton ..... Apex
*Catherine Cowles Shepherd ..... Wilkesboro
Kanak Lata Singh ..... Raleigh
Darlene Carol Smith ..... Sanford
Dana Kai Sorvas ..... Longwood, FL
Mark Stephen Spector ..... Raleigh
**Michele Elizabeth Studer ..... Newport, RI
**David Martin Szczesniak ..... Durham
H***David Allen Thompson ..... Clinton
Kimberly Heather Truscott ..... Tarboro
Yvette Marie Turner ..... Jacksonville
Kris Ann Walters ..... Raleigh
*Edith Kathryn Wilder ..... Franklinton
†***Robert Christopher Wilkins ..... Sterling
**Juliana Willey ..... Raleigh
†Brian Keith York ..... Kinston
Sae Young Yu ..... Fayetteville

School of Design

BACHELOR OF ARCHITECTURE

Degrees Conferred May 11, 1991

Amy Frances Allgeyer ..... Graham
David Patrick Bryson ..... Charlotte
**Curtis Hoffman Chi ..... Conover
Jerry Darrell Fink ..... Salisbury
Edmund Joseph Gontram III ..... Raleigh
***James Edward Gordon ..... Durham
Stephen Ellis Halsey ..... Durham
Jeffery Frank Harkey ..... Fayetteville
*David Stryker Hillhouse ..... Wayne, NJ
Michael William Huntanar ..... Fayetteville

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

*Barry Paul Icard ..... Conover
**Bronald Clay Johnson ..... Winston-Salem
Ziad S Kaddah ..... Shehim, LEBANON
John Phillip Kennett, Jr. ..... Colfax
Glenn Alan Knapp ..... Raleigh
Dawn Caprice Mackmull ..... Fayetteville
**Matthew Dale Messick ..... Greensboro
Robert Earl Nussear, Jr. ..... Raleigh
*Alfred Joe Poole III ..... Williamsburg, VA
David Samuel Rotman ..... Asheville
Victor Vines ..... Pinetops
**Kyle Howard Webb ..... Conneaut, OH

BACHELOR OF ENVIRONMENTAL DESIGN

Degrees Conferred May 11, 1991

***Susanne Hupp Adams ..... East Bend
Rose Patryce Britton ..... Chapel Hill
Angela Jeanette Medlin ..... Hamlet
*Heath Aaron Satow ..... Winston-Salem

BACHELOR OF ENVIRONMENTAL DESIGN IN ARCHITECTURE

Degrees Conferred May 11, 1991

James Ellis Baker ..... High Point
*Michelle Krystyn Barrows ..... Vermont
James Clark Bassett ..... Greensboro
**John Walter Beasley ..... Kitty Hawk
**John Amedeo Beddia ..... York, PA
*Thomas Gregory Conner ..... Salisbury
Wilsie William Crouch III ..... Charlotte
**Janet Scott Davis ..... Winston-Salem
***Elizabeth Grace Drehmel ..... Cary
Keri Leigh Duff ..... Brevard
Nicole Lynette Hodge ..... Elon College
Shelly Paige Jordan ..... Charlotte
James Trevor Lynch ..... Signal Mountain, TN
John Morris McGahey ..... Washington
**Jacqueline Marie McNaney ..... Woodstock, NY
Todd Alfred Michaloski ..... Rochester, NY
Elizabeth Hodges Moore ..... Raleigh
*Heather Patrice Murray ..... Louisville, KY
**Robert Michael Naegele III ..... West Miami, FL
**Kelly Kathleen O'Boyle ..... Chicago, IL
Myrna Amelia Olmos Muniz ..... San Juan, PUERTO RICO
***Dean Landon Young ..... Charlotte

BACHELOR OF ENVIRONMENTAL DESIGN IN LANDSCAPE ARCHITECTURE

Degrees Conferred May 11, 1991

*Ralph James Cox, Jr. ..... High Point
Shanda Harrelson Davenport ..... Manteo

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Becky Nanette Joyner ..... Greenville
Sheryl Marie Lindberg ..... LaGrange, IL

BACHELOR OF ENVIRONMENTAL DESIGN IN PRODUCT DESIGN

Degrees Conferred May 11, 1991

Eric Christian Garloff ..... Raleigh
George Warren Ginn ..... Richmond, VA
**Richard Henry Suter ..... Rehoboth Beach, DE
***Mitchell Ross Warren ..... Spruce Pine

BACHELOR OF ENVIRONMENTAL DESIGN IN VISUAL DESIGN

Degrees Conferred May 11, 1991

Ryan Odell Cummings ..... Summerfield
*Elizabeth Hart Dimmette ..... Lenoir
Nicole O'Dell Dutton ..... Hickory
Lynn Elizabeth Gallup ..... New Hill
***Chong Un Kim ..... Seoul, KOREA
Brady Paul McNamara ..... Raleigh
*Katherine Massey Sims ..... Charlotte
*Karen Lee Taylor ..... Durham
Donnie Wayne Williams ..... Robbins
Ronnie Lane Williams ..... Robbins

College of Education & Psychology

BACHELOR OF ARTS IN PSYCHOLOGY

Degrees Conferred May 11, 1991

**Ann Tomney Allen ..... Raleigh
H***Michael Todd Allen ..... Ramseur
Christine Ann Atkinson ..... Raleigh
David Middleton Batten ..... Raleigh
Christina Lynette Bouknight ..... Charlotte
**Sharon Aho Butler ..... Cary
Tammy Brynne Church ..... Raleigh
*Susan Elizabeth Dedmon ..... Lincolnton
Shawn Kelly Devine ..... Lincolnton
Laura Elizabeth Favor ..... Charlotte
**Tracy Lynn Field ..... Atlanta, GA
*Susan Jane Finch ..... Fayetteville
Wendy Lynne Grubb ..... Huntingdon, PA
David Tracy Hahn ..... Charlotte

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

*Tiffany Leigh Hall ..... Raleigh
*Lewis Preston Hancock, Jr. ..... Raleigh
Wayne Franklin Herrick ..... Asheville
Kelly Margaret High ..... Raleigh
Barry Lee Ingle ..... Horse Shoe
*William Elliot Inman ..... Raleigh
Emmett Glenn Johnson ..... Raleigh
Malina Kay Kapadia ..... Raleigh
Ralph Timothy Lawrence ..... Weaverville
*Cinnamon Chereé Ledford ..... North Wilkesboro
Tammy Larae Lewis ..... High Point
**Robert Walter Mann ..... Springfield, VA
Diane Katharyne Mascia ..... McMurray, PA
**Diana Rie Mason ..... Greenville, TX
Jennifer Lynne Matheson ..... Raleigh
Kristie Jeanine McGee ..... Benson
*Mary Elizabeth McMahon ..... Kinston
Monica Deborah Ore ..... Suitland, MD
***Alice Faulkner Pettyjohn ..... Raleigh
***John Walter Philbeck ..... Wake Forest
David Alan Poole ..... Raleigh
*Judith Bradshaw Potok ..... Cary
Louis Edward Pucillo II ..... Raleigh
Sharla Reneé Richards ..... Greenville
Jennifer Lynn Ritter ..... Raleigh
Maria K. Seneres ..... Elizabeth City
Christopher Andrew Showfety ..... Greensboro
Shannon Sherese Simmons ..... New Haven, CT
Meredith Jane Stewart ..... Gastonia
Meredith Ruth Swanson ..... Cary
Synthia Hall Sweere ..... Atlanta, GA
*Gerald Kenneth Takano ..... Riverside, CA
Ann-Marie Willis ..... Morehead City
Graham Clarke Wilson ..... Raleigh
Sonya Dee Worlds ..... Clayton

BACHELOR OF SCIENCE IN EDUCATION

Agricultural Education

Degrees Conferred May 11, 1991

***Georgena Ann Barefoot ..... Dunn
*James Edward Boyette III ..... Louisburg
John Kenneth Buck ..... Tabor City
Brian Keith Davis ..... Taylorsville
Chadwick Wayne Eller ..... Yadkinville
Donna Lee Koontz ..... Lexington
James Stewart McLamb ..... Angier
William Burtis Upchurch, Jr. ..... Morrisville

General Studies

Degrees Conferred May 11, 1991

Andre Jaye Austin ..... Selma
Heather Lynn Bailey ..... Charlotte
Cynthia Ann Daniel ..... Oxford
Stephen Paul Eller ..... Raleigh

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Health Occupations Teacher Education

Degrees Conferred May 11, 1991

***Janet Kershner Barclay ..... Hamburg, PA
***Linda Fornes Chitty ..... Goldsboro
Judith Hansley Durham ..... Raleigh
*Arlene Marie Fisher ..... Knightdale
***Connie Thompson McCullen ..... Princeton
***Stephanie Moore Taulbee ..... Raleigh

Industrial Arts Education

Degrees Conferred May 11, 1991

*Janet Woody Carter ..... McLeansville
Dana Louise Deaton ..... Tabor City
Michael Todd Fitch ..... Burlington
Alan Thomas Hamrick ..... Morganton
Christopher Rhodes Martin ..... Raleigh
William Jerome Mooring ..... Durham
John Charles Perkins ..... Roxboro
Stacy Larry Raynor ..... Rocky Mount
Regina Antoinette Salinas ..... Southern Pines

Marketing Education for Teachers

Degrees Conferred May 11, 1991

**Sharon Eugenia Irving ..... Wilmington
Gwendolyn Maxine Shaw ..... Southern Pines
*Ashley Kay Usrey ..... Lilesville

Mathematics Education

Degrees Conferred May 11, 1991

***Stephanie Denise Ayscue ..... Louisburg
Joycelyn Edwina Bethel ..... Kinston
Beverly Susan Cox ..... Asheboro
Carolyn Paige Bohn Edgerton ..... Princeton
Anjanette Denise Etheridge ..... Rocky Mount
Jeffrey William Ferrell ..... Greensboro
***Anthony Lawton Fulford II ..... Raleigh
Dale Edward Galloway ..... Rosman
**Sharon Joy Gann ..... Asheboro
*Christina Geracoulis ..... Wakefield, MA
Amy Yvonne Griffis ..... Fayetteville
*Daniel Bruce Hamrick, Jr. ..... Kings Mountain
**Christine Marie Hartzell ..... Knightdale
*Sonia Lynn Raynor Hines ..... Benson
**Melanie Ann Hudson ..... Concord
***Robert Arno Jesinger ..... Perkasie, PA
*Samuel Evans Johnson ..... Whiteville
Cynthia Dawn Koch ..... Burlington
**Katheryn Elizabeth Lee ..... Greensboro
Jennifer Diane Martin ..... Raleigh
Edward Fredrick Matthews II ..... Hubert
*Sherry Marie Mattocks ..... Kinston
**Amber Lynette McGee ..... Kernersville
Bambi Ann Metz ..... Raleigh
Jennifer Ann Nehmer ..... Raleigh

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

**Melinda Renee Petree ..... Winston-Salem
Steven Gregg Pulliam II ..... King
*Mark Robert Sinopoli ..... Advance
Rhonda Gianetta Thompson ..... Fairmont
**Fran Marie Twiddy ..... Hope Mills
***Kimnberly Dawn Wood ..... Raleigh
*Stephanie Lee Wood ..... Benson

Mathematics Education, Middle Grades Concentration

Degrees Conferred May 11, 1991

***Tracy Lyn Barker ..... Raleigh
**Detrice Renee Brooks ..... Wake Forest
Amy Helen Carter ..... Angier
*Patricia Gail Herron ..... Burlington
Vicki Yvette Murrain ..... Wilson
Sharon Annette Stevenson ..... Roxboro

Middle Grades, Language Arts and Social Studies Concentration

Degrees Conferred May 11, 1991

Elizabeth Ann Daughtry ..... Pikeville
**Christy Laney Davis ..... Monroe
Rhonda Gail Evans ..... Ash
Leah Lynn Farriba ..... Garner
Doris Anne Freeman ..... Raleigh

Middle Grades, Mathematics and Science Concentration

Degrees Conferred May 11, 1991

Angela Arlene Branch ..... Atlanta, GA
Jackie Lynn Creech ..... Beulaville
Daphne Annette King ..... Ash
Dawn Forrest Pratt Sanders ..... Cary

Science Education

Degrees Conferred May 11, 1991

Kimberly Ann Adams ..... Marion
Susan Elizabeth Anderson ..... Chapel Hill
**Heidi Jean Berenson ..... Raleigh
Rebecca Ellen Blackman ..... Selma
Joseph Thomas Campbell, Jr. ..... Dunn
***Tammy Lynn Crafton ..... Burlington, IA
Elizabeth Anne Doggett ..... Summerfield
†***Angela Jill Driver ..... Mocksville
†**Charlene Kay Eller ..... Kernersville
**Stephanie Denice Gaskill ..... Harkers Island
**David Brent Gore ..... Fayetteville
***Rhonda Joan Hampton ..... Florence, KY
Sharon Lavene Hill ..... Wilmington
Francine Delores Kearney ..... Louisburg
*Lee Andrea Miller ..... Raleigh
†Connie Ellen Morton ..... Albemarle
Robin Eugene Pate ..... Lumberton
Carl Mercer Stafford ..... Louisburg
***Jennifer Lynne Strickland ..... Henderson
Robert Lennon Verrier ..... Autryville
***Gail Theresa Watts ..... Cary

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

TECHNICAL EDUCATION

Degrees Conferred May 11, 1991

Kenneth Robert Campbell ..... Mayville, NY

College of Engineering

BACHELOR OF SCIENCE IN BIOLOGICAL AND AGRICULTURAL ENGINEERING

Jointly administered by the College of Agriculture and Life Sciences and the College of Engineering.

Degrees Conferred May 11, 1991

Amsey Ashbell Boyd, Jr. ..... Hamlet
Douglas Richard Cowan ..... Littleton
**Stephen Lonnie Crawford ..... Franklin
Anders Sture Johansson ..... Salisbury
Steven Eric Lawing ..... Charlotte
William Shannon Peede ..... Ayden

BACHELOR OF SCIENCE IN TEXTILE ENGINEERING

Jointly administered by the College of Textiles and the College of Engineering.

Degrees Conferred May 11, 1991

*Andy Maurice Barefoot, Jr. ..... Knightdale
***Jeffrey Allen Funderburk ..... Charlotte
**Alan Edward Wright ..... Charlotte

BACHELOR OF SCIENCE IN AEROSPACE ENGINEERING

Degrees Conferred May 11, 1991

*Grigorios Aristidis Alexopoulos ..... Elizabeth City
*Jarvis James Arthur III ..... Nashville
Joseph Gregory Ashe ..... Sylva
William Fredrick Bird ..... Durham
**Bernard Michael Blell ..... Raleigh
Christopher Palmer Budahl ..... Cullowhee

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Tracey Clarice Bullock ..... Henderson
***Patrick Wellington Canupp ..... Clemmons
***Joel Edward Cate ..... Gastonia
Bernard Chi ..... Chapel Hill
Keith Donnell Cochran ..... Reidsville
Eric Paul Critchley ..... Sumter, SC
Richard Lee Dunavan ..... High Point
Michael Howard Duncan ..... Ellenboro
John Buford Fuller II ..... Burlington
Jeffery Paul Herman ..... Hudson
*Clint Luigie Ingram ..... Huntersville
Lyle Houston Lee ..... Raleigh
Heather Lynn Pauley ..... Fayetteville, GA
***Brian Christopher Platz ..... Hendersonville
Joseph Francis Steffen ..... Lancaster, OH
Glenn Scott Tetterton ..... Plymouth
Jordan Robert Walker ..... Cary
**Eric Scott Warren ..... Mt. Airy
***Vincent Gregory Weirs ..... High Point
Margaret Woloschek ..... Milwaukee, WI

BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING

Degrees Conferred May 11, 1991

†Joey Kyle Albright ..... Troy
Maria Lou Amigo ..... Durham
†*Christopher William Blenk ..... Raleigh
Michael Scott Bolick ..... Hickory
Alan David Brewer ..... Germantown
James Edward Brown ..... Rocky Mount
*Jarrett Taylor Brown ..... Wilmington
Carol Amelia Cooke ..... Newton
Tammy Dene Dail ..... Raleigh
***John Edward Davis ..... Forest City
Peter Jon Day ..... Lansing, MI
*Cynthia Ruth De Haas ..... Wilmington
Anissa Gea Diatzikis ..... Concord
*John William Graves ..... Pensacola, FL
Robert Frank Green ..... Charlotte
Charles Jefferson Harris ..... Kingsport, TN
**Larry Scott Jackson ..... Ashland, VA
Donald James Janiak ..... Salisbury
James Wayne Johnson II ..... Cameron
***David Scott Jones ..... Raleigh
**Linda Noel Jones ..... Jefferson
Maria Patricia Kelly ..... Greenville
David Alan Klimkowski ..... Gastonia
Michael Frederic Koerschner ..... Charlotte
Scott Stephen Lowe ..... Phillipsburg, NJ
†Robert Glenn McRee ..... Rome, GA
Sterling Terrell Miller ..... Denton
***Christopher Herman Nelli ..... Gastonia
Richard Neil Owen ..... Avella, PA
†Breton Bonner Pate ..... Wilmington
*Heather Lynn Phillips ..... Scotia, NY
Jerry Randall Piercy, Jr. ..... New Bern

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Ana Maria Piqueras ..... Raleigh
†Daniel Edwin Pouchot ..... Achilles
**John Charles Powers ..... Greensboro
†*Sonia Rahman ..... Winston-Salem
*Michael Jonathan Reece ..... Pfafftown
**Leigh Elizabeth Ringer ..... Greenville
***Boyd Thompson Safrit ..... Hendersonville
***Frederick Charles Samz, Jr. ..... Asheville
Kristine Anne Scott ..... Valparaiso, IN
Katherine Anne Sharp ..... Aiken, SC
Paul Truman Shrewsbury ..... Providence
**John Charles Single ..... Atlanta, GA
†Cyrus John Stacey ..... Washington, DC
**Jennifer Susan Stevenson ..... Charlotte
***Lori Renee Toth ..... Cary
Vipul Braj Varma ..... Chula Vista, CA
George Roberts Wallace ..... Raleigh
†Richard Bruce Williams, Jr. ..... Raleigh
*Susan Rena Yount ..... Granite Falls

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

Degrees Conferred May 11, 1991

Michael David Allen ..... Charlotte
Patrick Allen Beville ..... Asheville
Michael John Birkland ..... Annandale, VA
James Frank Bridges, Jr. ..... Maxton
*Jeanette Carol Briggs ..... Philadelphia, PA
*Melissa Ruth Britt ..... Cary
Steven Lawrence Brown ..... Brandenton, FL
Kimberly Ann Bryant ..... Rocky Mount
Lydia Augusta Cannon ..... Ahoskie
**Eric Boyd Carpenter ..... Gastonia
Lisa Michele Cole ..... Charlotte
Christopher Robert Cox ..... Goldsboro
Frank Emmett Deaner, Jr. ..... Wilmington
Davis Clinton Diggs ..... Rockingham
Jeffery Scott Douglas ..... Sanford
Jeremiah Minear Edwards ..... Durham
**Mary Beth Everett ..... Blanch
Gary Mitchell Flowers ..... Sims
*David Kent Fonvielle ..... Wilmington
Amy Lynette Furr ..... Midland
Paul Gregory Garrett ..... Charlotte
John Harold Grant ..... Cary
Victoria Charlene Gulledge ..... Charlotte
Gerald Thomas Heavey ..... Raleigh
James Lawrence Hench ..... Wrightsville Beach
Carolyn Elizabeth Hignutt ..... Jamestown
***Joseph Cornwell Hines ..... Farmville, VA
Sandra Kay Holden ..... Robbins
Anne Doman Hunt ..... Mars, PA
Robert Preston Hunter ..... Kinston
Mark Douglas Irwin ..... Raleigh
Jerry Dean Jennings ..... Elizabeth City
Glenn Tracy Johnson ..... Bethlehem
John Nils Johnson ..... Richmond, VA

*Kenneth Paul Keel ..... Williamston
Randy Lee Kepler ..... York, PA
John Steven Kite, Jr. ..... Greenville
Ronald Daniel Krall ..... High Point
*Kirsten Nina Lewis ..... Raleigh
Christopher John Lory ..... Matthews
**James Michael Malone ..... York, PA
*Charles Morris Marshall ..... Fayetteville
Donald Richard McCurdy ..... Siler City
James Alton McInnis, Jr. ..... Sanford
Julian McRae McIntyre ..... Fayetteville
Randall Wade Midgett ..... Elizabeth City
James O'Dell Morrison, Jr. ..... Raleigh
Justin Ngossele ..... Banqui, Central African Republic
Stephanie Lee Norris ..... Wilmington
Emily Elizabeth Oldham ..... Chapel Hill
Brian Wayne Purvis ..... Goldsboro
Johanna Daniels Quinn ..... Charlotte
**Michael Dwayne Rakestraw ..... Reidsville
Stephen Thomas Smallwood ..... Durham
Joseph Cullen Stowe III ..... Charlotte
Daniel Jay Strong ..... Raleigh
*Karl Vernon Sutter III ..... Wilmington
***Laura Elizabeth Sutton ..... Jacksonville
*Harold Thomas Tant ..... New Bern
Kent Lewis Taylor ..... Brookville, IN
James George Teta, Jr. ..... Winston-Salem
Mark Emanuel Turner ..... Charlotte
Mary Elizabeth Vanderburg ..... Charlotte
Frances Dibrell Vess ..... Wilson
Jeffrey Craig Voet ..... Wrightsville Beach
James Broderick Voso ..... Pisgah Forest
Scott Wayne Walston ..... Tarboro
Christopher Glenn Whiteside ..... Charlotte
Douglas Dale Wyrick ..... Greensboro

BACHELOR OF SCIENCE IN CIVIL ENGINEERING—CONSTRUCTION OPTION

Degrees Conferred May 11, 1991

Erik Albert Anderson ..... New Stanton, PA
Matthew Ellis Blankinship ..... Raleigh
Diane Esther Boykas ..... Coopersburg, PA
John Calvin Brantley IV ..... Raleigh
*John Worth Carson III ..... Newport
Daniel Christopher Coutu ..... Salisbury
*Percy Haywood Daughtry III ..... Kenly
Wayne Douglas Greenlee, Jr. ..... Brandon, FL
James Watts Miller, Jr. ..... Sunset Beach
Christopher Scott Register ..... Wilmington
Scotty Gene Shoaf ..... Concord
**David Lee Stout, Jr. ..... Sanford
†*Steven John Strohm ..... Table Rock, NE
Nilesh Madhusudan Surti ..... Jacksonville
Matthew Jay Threadgill ..... Laurinburg
Douglas McCoy Tillett ..... Manteo
Luis Turner ..... Raleigh
Christopher William Varner ..... Marion, OH

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF SCIENCE IN COMPUTER ENGINEERING

Degrees Conferred May 11, 1991

Derek Durrell Ballard ..... Winston-Salem
*George Foy Bennett ..... Raleigh
†*Christopher Mark Briggs ..... Graham
***Jeffrey Alan Craig ..... Gastonia
Phillip Graham Dickerson, Jr. ..... Greenville
†*Charles Lewis Evans ..... Edenton
James Dylan Evans ..... Pleasant Garden
John Barnes Flanigan III ..... Camp Lejeune
†**Harold Albert Johnson ..... Kernersville
†Charles Lester Jones ..... Winston-Salem
**Saju Daniel Joy ..... Cary
†Sonja Alelia Koonce ..... Greensboro
***Havish Koorapaty ..... Madras, INDIA
†Ravindra Chandulal Lalka ..... Sanford
†***John Wesley Lewis, Jr. ..... Greensboro
†*Jay Kevin Lloyd ..... Burlington
†John Kevin Mason ..... Roanoke Rapids
Loan Hong Nguyen ..... Raleigh
**Vipul Kaushik Patel ..... Charlotte
*Henry Carl Powers, Jr. ..... Fayetteville
Fredrick Booth Rankins, Jr. ..... Connelly Springs
*David Russell Rhodes ..... Raleigh
*Philip Anthony Rook ..... Greensboro
Paris Sandro Sorkin ..... Fayetteville
***Luther Wilson Stephens IV ..... Columbus, MS
†William Whiting Toler ..... Chocowinity
†John Gregory Upchurch ..... Cary
†*Lewis Jaye Whitmire ..... Hickory
Sang Sik Woo ..... Raleigh
***Michael Thomas Zimmerman ..... Cary

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

Degrees Conferred May 11, 1991

David Edward Bouzigard ..... Kinston
Michael Jesse Britt ..... Raleigh
**George Robert Browning ..... Raleigh
**Matthew Gerald Burke ..... Charlotte
Terry Thomas Byron ..... Raleigh
Daniel Cameron Carr ..... Raleigh
Michael Kenneth Claes ..... Hauppauge, NY
Greg Spencer Donnelly ..... Hickory
Christina Rhea Eddins ..... Raleigh
Walter Jason Edge ..... Fayetteville
Victoria Amber Fritzler ..... Winston-Salem
***Savon Scarboro Gay ..... Wendell
Antonio Marcellus Green ..... Spring Lake
Edney Wayne Holder ..... Concord
***Robert Sebastian Hubbard ..... Winston-Salem
*Anita Ila Israel ..... Rosman
**Steven Richard Jones ..... Tampa, FL
William Robert Joynt ..... Richmond, VA
Jiun Kim ..... Taegu, S. KOREA

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

†**Kenneth James Klimkowski ..... Gastonia
William Andrew Kocak ..... Charlotte
Patricia Anne Lacewell ..... Burgaw
*Susan Marie Lach ..... Raleigh
Jenny Chi-Ju Lee ..... Cary
†***John Wesley Lewis, Jr. ..... Greensboro
***Joan Liang ..... Beijing, PEOPLES REPUBLIC OF CHINA
Paul Ernesto Long ..... New Providence, NJ
Terrie Lee Martin ..... Hamlet
Charles Curtis Mathews, Jr. ..... Orlando, FL
Lorraine Gaultois Mercer ..... Cary
Kevin Paul Millsap ..... Raleigh
Bobby Darren Moore ..... Kernersville
Thad McCoy Mullis ..... Lenoir
Chinh Nguyen ..... Greensboro
Edward Wayne Niedens ..... Wilmington
*Roderic Lyle Oliver ..... Dayton, OH
Eric James Olson ..... Raleigh
Cynthia Lynne Parrish ..... Raleigh
Swati Ghanshyam Pathak ..... Durham
Wilson Pauldin II ..... Fayetteville
Christian David Petretich ..... Alexandria, VA
James Randall Pierce ..... Raleigh
Vera Ellen Pitts ..... Winston-Salem
*Robert Winn Prewitt ..... Wilson
†Charles Robert Rhodes II ..... Greensboro
Chris Alex Sagris ..... Raleigh
***John Patrick Schroedl ..... Canal Fulton, OH
Michael Shawn Shepard ..... Hampstead
Charles Franklin Sherrill, Jr. ..... Raleigh
Sandra Lynn Smith ..... Raleigh
**Kenneth Lee Stewart, Jr. ..... Raleigh
Scott Richard Stonefield ..... Cary
Christopher John Tector ..... Cary
***Eric Leland Terwilliger ..... Cary
**Michael David Watkins ..... Henderson
James Franklin Webb, Jr. ..... Elm City
**David Lee Whiteman ..... Buies Creek
*Lewis Jaye Whitmire ..... Hickory
**Kevin Dave Wilson ..... Fayetteville
Richard James Wood ..... Juneau, AK

BACHELOR OF SCIENCE IN CONSTRUCTION MANAGEMENT

Degree Conferred May 11, 1991

†*Steven John Strohm ..... Table Rock, NE

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

Degrees Conferred May 11, 1991

Shabbir Ismail Adamali ..... TANZANIA
Kevin Brian Baird ..... Mt. Airy
*Krista Dawn Baker ..... Apex
Lori Lee Baker ..... Patterson, NJ
Carol Marie Ballard ..... Charlotte

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Darick Barnes ..... Indianola, MS
Rick Thomas Bartosik ..... Wilmette, IL
**Douglas Arnold Bickers ..... Winston-Salem
Andrew Harper Bond ..... Bedford, VA
Keith Howard Bottoms ..... Tarboro
†*Christopher Mark Briggs ..... Graham
James Knox Brigman ..... Marshall
Mark Cameron Cassada ..... Clemmons
Selvan Thirumalaiswamy Chettiar ..... Raleigh
***Aaron Vincent Chew ..... Greensboro
David Earl Clapp ..... Greensboro
Christine Marie Clark ..... Greensboro
**Michael Scott Cobb ..... Landis
Patrick Leslie Cowell ..... Washington
Brian Robert Crawford ..... Oak Ridge, TN
Samir Makarand Dandekar ..... Raleigh
Thomas Clifford Decker ..... Durham
*Andre Steven DeMaurice ..... Buxton
***John Joseph Devine, Jr. ..... Asheville
Sandra Webster DeVoogel ..... Garner
***Ameetinder Singh Dhillon ..... Cary
*Clinton Gerard Downing ..... Raleigh
Jonathan Brian Duke ..... Durham
Tuan Anh Duong ..... Raleigh
Jeffrey John Durr ..... Raleigh
†Robert Douglas Edmondson ..... Creston
**Michael Scott Elks ..... Greenville
†*Charles Lewis Evans ..... Edenton
Scott Benard Foster ..... Irving, TX
Robert Wesley Fulk ..... Rocky Mount
***Scott William Gallimore ..... Goldsboro
***Lisa Renee Goss ..... Durham
Richard Glenn Gravely III ..... Broadway
Brian Richard Hammill ..... Richfield
Pauline Hankins ..... Boliva
***Sandra Mary McLeod Harper ..... St. Paul, MN
***Matthew Burdet Harris ..... Durham
Richard Edwin Hartsfield, Jr. ..... Wilmington
**Tasha Lynn Helderman ..... Albemarle
Dale Lee Hemmie, Jr. ..... Fort Madison, IA
Anthony William Hewitt ..... Davidson
***Michael Paul Hicks ..... Tobaccoville
James Anthony Holden ..... Hillsborough
**John Russell Holden ..... Raleigh
John Edward Hunnell ..... Durham
Don Edward Hunnicutt ..... Hendersonville
***Joseph Jack Hurley ..... West Jefferson
*Curtis Jerome Ijames ..... Mocksville
†**Harold Albert Johnson ..... Kernersville
†Charles Lester Jones ..... Winston-Salem
Priscilla Jordan-Williams ..... Oxford
**Michael Francis Kler ..... Cocoa, FL
†**Kenneth James Klimkowski ..... Gastonia
†Sonja Alelia Koonce ..... Greensboro
†Ravindra Chandulal Lalka ..... Sanford

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Wen-Yih Lee ..... Salisbury
†***John Wesley Lewis, Jr. ..... Greensboro
†*Jay Kevin Lloyd ..... Burlington
Charles Earsen Loftin, Jr. ..... Mt. Holly
Paul Foster Lowell ..... Wilson
***Reem Yousef Mahdi ..... Gaza, PALESTINE
**Gregory Glenwood Mann ..... Raleigh
†John Kevin Mason ..... Roanoke Rapids
Jeryl McIver ..... Crescent, GA
Tonya Alisa Melvin ..... Newburgh, NY
Steven Milton Mincey ..... Durham
Alexander Jonathan Molnar IV ..... Charlotte
†Michael Austin Netzer, Jr. ..... Raleigh
Ronald Sha Nobles ..... Tabor City
*Walter Ray Overcash ..... Mooresville
**Jeffrey Damon Pierce ..... West Jefferson
Michael Hugh Pierce ..... Fayetteville
Manjula Deepal Premasinghe ..... Colombo, SRI LANKA
*Vernon David Price ..... Charlotte
Mark Walter Reams ..... Burlington
**Leigh Anne Rettinger ..... Raleigh
Gregory Leroy Reynolds ..... Raleigh
Kelly Scott Rhodes ..... Brevard
Dale Bryan Rogers ..... Concord
Afshin Roshdi ..... Cary
Alexis Santi ..... Hickory
**Kenneth Edward Satterwhite ..... Bunn
**Bradley Vance Sellers ..... Wilmington
***Kevin Michael Shay ..... Charlotte
***Jeffrey Blanton Shealy ..... Hendersonville
Dale Carlyle Sikora ..... Hendersonville
Rodney LaShon Spells ..... Goldsboro
*Paul Barton Sullivan ..... Greenville
Christopher Lee Thompson ..... Wilson
†William Whiting Toler ..... Chocowinity
***Amy Jo Troutman ..... Annandale, VA
†John Gregory Upchurch ..... Cary
Lorne Anthony Vidrine ..... Wilkesboro
Susan Gaye Walker ..... Coats
*Charles Erick Waterworth ..... Boone
†*Lewis Jaye Whitmire ..... Hickory
John Lawrence Zimmerman ..... Raleigh

BACHELOR OF SCIENCE IN FURNITURE MANUFACTURING AND MANAGEMENT

Degrees Conferred May 11, 1991

Michael David Bowers ..... Thomasville
James Scott Durham ..... Burlington
Rhonda Leigh Isaac ..... Maiden
Eric William King ..... Harrisburg
*Michael Olen Miller ..... Greensboro
Keith Battle Nichols ..... High Point
William Franklin Norton ..... High Point
†Daniel Allen Prevost ..... Waynesville
Mark Allen Roberts ..... Cary

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF SCIENCE IN INDUSTRIAL ENGINEERING

Degrees Conferred May 11, 1991

Jodi Lynn Aldridge ..... Tobaccoville
Sherry Michelle Andrews ..... Rocky Mount
Maury Allen Beck ..... Livingston, NJ
Darryl Leon Black ..... Fayetteville
Kevin Thomas Bradford ..... Cary
Warren Carl Childers ..... Goldsboro
Frederick Roy Clifford, Jr. ..... Winston-Salem
**Tangela Craft ..... Walstonburg
Angeli Mukul Ekka ..... Prince George, VA
Valerie Jean Gill ..... Vienna, VA
Hoyt Milton Hackney III ..... High Point
Robert James Henes ..... Cuyahoga Falls, OH
Candace Ellen Hill ..... Kernersville
Brian Newton Johnson ..... Hendersonville
Jeffrey Allan Johnson ..... Raleigh
Michael Scott Jordan ..... Charlotte
Kevin Joseph Juanes ..... Clinton
Jeffrey Neil Killian ..... Taylorsville
Young Hwan Kim ..... Raleigh
Brent Troy Lammert ..... Danbury, CT
**Leah Deshon McDonald ..... Concord
***April Diane Moon ..... Durham
Martha Anne Narron ..... Chester, VA
*Timothy Craig Patterson ..... Hendersonville
**David Carter Pope ..... Raleigh
†Daniel Allen Prevost ..... Waynesville
Alex Hamel Price ..... Cullowhee
***Sonya Lee Richardson ..... Hillsborough
Richard Scott Robie ..... Raleigh
Roderick Generald Robinson ..... Charlotte
Eric Rowland Saunders ..... Raleigh
***James David Sebring, Jr. ..... Hampton, VA
*Kimberly Lynn Shelton ..... Marshall
Gary Dale Snipes, Jr. ..... High Point
Natalie Ann Spinks ..... Wilmington
John Kelly Stafford ..... Raleigh
*Kimberly Marie Stokely ..... Brevard
Jennifer Lynn Strickland ..... Oxford
***Joanna Bane Watters ..... South Charleston, WV
Dorothy Katrina Womble ..... Kings Mountain
**Christopher Kevin Woodfin ..... Statesville
***Amy Deanne Wyatt ..... Mt. Holly

BACHELOR OF SCIENCE IN MATERIALS SCIENCE AND ENGINEERING

Degrees Conferred May 11, 1991

Charles Timothy Benfield ..... Weaverville
Samuel James Bright, Jr. ..... Sylvania, OH
Peter Dean Carey ..... Raleigh
Gwen Elaine Clark ..... Durham
Alexander Brian Dillard ..... Blacksburg, VA
Alexander Dewey Dodson II ..... Lynchburg, VA
Georges Levon Fattal ..... Gaithersburg, MD
*Stephen Constantine Kokenes ..... Charlotte
Darryl John Kroeze ..... Burlington

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

**Robert Tyler Leonard ..... Greer, SC
*Davis Andrew McClure ..... Rocky Mount
Ken Andrew McMillen ..... Charleston, WV
Julie Marie Miller ..... Rocky Mount
Jeffrey Thomas Moore ..... Painted Post, NY
Randi Ann Muir ..... Raleigh
William Bruce Muir ..... Wilmington
*Fimy Ruth Sivazlian ..... Gainesville, FL
†Brent Stephen Stone ..... Raleigh
Judith Reeves Stuart ..... Atlanta, GA
Nkadi Sukidi ..... Raleigh
James Dudley Taylor ..... Kernersville
*Michelle Carole Turner ..... Hope Mills
**Paul Mattackal Verghese ..... Raleigh
***Christina Suzanne Wixson ..... Gastonia
Scott David Wolter ..... Wendell
*Gary Franklin Wood ..... Fayetteville

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

Degrees Conferred May 11, 1991

John Clay Adams ..... Greensboro
Trenton Baxter Allman ..... Winston-Salem
Eric Emmanual Alston ..... Sanford
Stephen William Andre ..... Emerald Isle
Frank Darryl Barile ..... Shreveport, LA
Colleen Suzzanne Bay ..... Marshall, MI
William Cherry Beach, Jr. ..... Hamilton
*James Andrew Beaman ..... Greensboro
*David Charles Bennett ..... Brevard
Britt Nelson Bobbitt ..... Henderson
Richard Thomas Bottoms ..... Rocky Mount
Michael Eugene Brown ..... Raleigh
Wesley Scott Buchanan ..... Galax, VA
Chad Adam Burel ..... Hillsborough
William David Buynitzky ..... Raleigh
Colin Matthew Campbell ..... Raleigh
Shawn Cecil Capps ..... Raleigh
**William Kevin Carpenter ..... Danville, VA
John Edward Carr, Jr. ..... Plymouth
*Angela Kay Carter ..... Hendersonville
Clinton Eugene Clyburn III ..... Charlotte
Robert Lee Cope III ..... Charlotte
Douglas Ray Cornett ..... Lenoir
*Carolyn Vaniene Cox ..... Wake Forest
Norman Lester Creekmore, Jr. ..... Elizabeth City
John Marriott Crockford ..... Charlotte
John Preston Davis ..... Pittsboro
*David Jose deMiranda ..... Raleigh
Donna Marie Dettling ..... St. Louis, MO
*Jerry Lee DeWeese, Jr. ..... Sylva
**Jill Colette Donaldson ..... Charlotte
Ryan E. Donnalley ..... Kernersville
Waynetta Dawn Dyson ..... Mocksville
Dennis Odell Earnhardt ..... Gold Hill
David Jon Edgington ..... Raleigh
John Andrew Edwards ..... Murfreesboro
Tony Wayne Evans ..... Edenton
Stephen Michael Fritz ..... High Point

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Errin Wesley Fulp ..... Raleigh
Anthony Lewis Gaddy ..... Canton
**Charles Lawrence Gaither III ..... Asheville
John Christopher Gardiner ..... Cary
**Gerrit Jan Gast VI ..... Almelo, THE NETHERLANDS
Susan Lin Grant ..... Waxhaw
*Arthur Owen Hall ..... Magnolia
Eric Eugene Hamilton ..... Brookeville, MD
***Eric Christopher Hilton ..... Thomasville
Michael Thomas Hobbs ..... Rocky Mount
George Bryan Holberton ..... South Boston, VA
William Ned Hooper ..... Waynesville
Michael Hughes ..... Chapel Hill
*Jihad Georges Jabbour ..... Raleigh
Paul Charles Jenkins ..... Hickory
James Todd Jones ..... Gibsonville
Khaled Moustafa Karmous ..... Raleigh
Robert Simmons Kingery ..... Charlotte
**Michael Paul Klas ..... Buffalo, NY
Jeff Owen Kriegsman ..... Greensboro
John Michael Lantz II ..... Parkersburg, WV
*John Howard Laughter ..... Hendersonville
Harold Wayne Lee II ..... Benson
Marshall Timothy Lowery ..... Roxboro
Marshall Brett Mabe ..... Kernersville
Jeffrey Allen Marlowe ..... Calabash
David Philip Matthews ..... Raleigh
*Jonathan Lane McNaull ..... Durham
Todd Charles Meissner ..... Charlotte
Stephen Donald Melby ..... Denver
Randy Scott Mills ..... Huntersville
Christopher Todd Moore ..... Matthews
David William Moushey ..... Tarpon Springs, FL
***Joan Everett Murray ..... Hendersonville
Joseph Norman Myers, Jr. ..... Denver
Roger Louis Ogburn ..... Winston-Salem
Daniel LaMont Owens ..... Charlotte
**Billy Malcolm Paderick, Jr. ..... Seven Springs
Joseph Antonio Pendola ..... Raleigh
Charles Kent Perry ..... Salisbury
**Nelson Bruce Petteys ..... Greenwich, NY
Michael Conrad Phelps ..... Winston-Salem
Robert Alan Porter ..... Winston-Salem
Elise Darlene Powell ..... Gulfport, MS
*David Joseph Price ..... Harrisburg
Craig Alan Pryzgoda ..... Jamestown
Steven Wade Puckett ..... Kinston
*Steven Wesley Reagan, Jr. ..... High Point
*Bennie Arthur Register, Jr. ..... McLeansville
Darren William Rhyne ..... Gastonia
Richard Webster Roddy, Jr. ..... Littleton
***Russell Milton Ruckterstuhl ..... Slingerlands, NY
David Matthew Schandel ..... Oxford
Theodore Travis Schommer ..... Mars Hills
David Lawrence Schweikert ..... Raleigh
*Mark Andrew Seaboch ..... Salisbury
David William Seay ..... Raleigh
Steven Peter Sharpe ..... Eden
Lowell Joseph Speight ..... Jamestown

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

*James Mark Spliedt II ..... Fuquay-Varina
**Malcolm Russell Stout, Jr. ..... Lillington
Kevin Richard Strauss ..... Rockville, MD
Yvette Michelle Stroman ..... Orangeburg, SC
*Eric Darren Sturgill ..... Gastonia
Jimmie Anthony Stutts ..... Eden
**Matthew Hill Thompson ..... Raleigh
Robert Lee Tucker ..... Greensboro
*Julie Kiser Turner ..... Carthage
Michael Bruce Tussey ..... Lexington
Douglas Gordon Voss ..... Pocomoke City, MD
James William Wallace III ..... Cullowhee
James Lewis Ward, Jr. ..... High Point
Larry Irving Watson, Jr. ..... Plymouth
William Robert Williams, Jr. ..... Greensboro
Robert Eugene Williamson ..... Connelly Springs
Michael Connelly Wise ..... Stedman
Archie Craig Yokeley ..... Winston-Salem

BACHELOR OF SCIENCE IN NUCLEAR ENGINEERING

Degrees Conferred May 11, 1991

*Eric Jerard Geyer ..... Raleigh
Garland Ray Priddy, Jr. ..... Richmond, VA
Quincy Merrell Read ..... Pfafftown
William Todd Sneed ..... Swansboro
Douglas Eugene Steele, Jr. ..... Plymouth

College of Forest Resources

BACHELOR OF SCIENCE IN CONSERVATION

Jointly administered by the College of Forest Resources and the College of Agriculture and Life Sciences.

Degrees Conferred May 11, 1991

Garret Mather Foskit ..... Wheaton, IL
Lauren Elizabeth Kolodij ..... Durham

BACHELOR OF SCIENCE IN FORESTRY

Degrees Conferred May 11, 1991

Wendell Roy Ball ..... Whiteville
Robert Norman Binns, Jr. ..... Raleigh
*David Preston Blevins ..... Raleigh
*Stephen Martin Daniels ..... Greensboro

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

William Carl Johnson II ..... Morganton
David Mark Lane ..... Tavares, FL
**Kevin Timothy Nunnery ..... Rutherfordton
Alfred Edward Schatzki ..... Richmond, VA
Phillip Edward Whitlow ..... Brookneal, VA

BACHELOR OF SCIENCE IN PULP AND PAPER SCIENCE AND TECHNOLOGY

Degrees Conferred May 11, 1991

†Joey Kyle Albright ..... Troy
James Fitzgerald Best ..... Roxboro
†*Christopher William Blenk ..... Raleigh
Matthew Ross Brown ..... Franklin, VA
Douglas Frank Falls ..... Franklin, VA
Charles Kevin Haney ..... Canton
Stephen Patrick Lawson ..... Savannah, GA
†Patrick Wayne Low ..... Rock Hill, SC
†Robert Glenn McRee ..... Rome, GA
***William Anthony Norris ..... Wilmington
†Breton Bonner Pate ..... Wilmington
†Daniel Edwin Pouchot ..... Achilles, VA
***Edward Allen Turner, Jr. ..... Franklin, VA
**Gregory James Venditti ..... Monroe, CT
†Richard Bruce Williams, Jr. ..... Raleigh

BACHELOR OF SCIENCE IN RECREATION RESOURCES ADMINISTRATION

Degrees Conferred May 11, 1991

Cyrus Watson Brame III ..... North Wilkesboro
Nelson Lee Cooper ..... Raleigh
Chip G. E. Futrell, II ..... Denton
*Jeffrey Blake Green ..... Halifax
William David Jackson, Jr. ..... Hope Mills
Krista Lee Jensen ..... Metuchen, NJ
*Hallie Suzanne McCormack ..... Charlotte
**Michele Kopchick Murtha ..... Saltsburg, PA
Jill Ann Rutten ..... Silver Spring, MD
David Irby Smith ..... Stanley
Antonia Marie St Louis ..... Morganton
Randell Wayne Vest ..... Sanford

BACHELOR OF SCIENCE IN WOOD SCIENCE AND TECHNOLOGY

Degrees Conferred May 11, 1991

Anthony Albert Amitrano III ..... Chapel Hill
*Clyde Gene Arnette, Jr. ..... Dillon, SC
John Greer Wetherington ..... Kinston

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

College of Humanities and Social Sciences

BACHELOR OF ARTS IN ACCOUNTING

Degrees Conferred May 11, 1991

Allie Amanda Abbott ..... Henderson
*Ann Elizabeth Altman ..... Charlotte
*Gail Marciel Baird ..... Raleigh
Grant Edward Barger ..... Charlotte
*Christopher Gray Berrier ..... Thomasville
*Brantley Joseph Blanchard ..... Raleigh
Judith Lynne Bowes ..... Greensboro
**Elizabeth Ann Bowman ..... Burlington
*Veronica Susan Byrd ..... Burlington
*Cameron Elizabeth Carter ..... Raleigh
*Paula Michelle Castello ..... Racine, WI
Rhonda Michele Chisolm ..... Charlotte
Barry Glenn Coates ..... Fayetteville
*Barbara Lee Coleman ..... Cary
Amy Irene Collier ..... Smithfield
***Debbie Villwock Cordon ..... New Bern
***Kathryn Ann Davis ..... Cary
**Kellie Kaleen Davis ..... Lewisville
Thomas Eugene DeVito ..... Fairmont, WV
†Sheri Lynn Dyer ..... Cary
**Katherine Alys Elam ..... Charlotte
***Barbara Green Elmore ..... Bahama
***Mona Sayed Elnaga ..... Raleigh
†Sammy Earl Estridge III ..... Badin
Charles Derek Farmer ..... Beaver Creek, OH
Michele Marie Forrest ..... Rockville, MD
*Cheng-Yin Gan ..... Kuala Lumpur, MALAYSIA
**Joanne Terry Gibson ..... Selma
David William Gordon ..... Pilot Mountain
Jon Eric Grant ..... Wilson
Kevin Andreu Griffin ..... Richmond, VA
Kimberly Anne Griffin ..... Winston-Salem
†James Richard Griffith ..... Charlotte
Bonnie Joyce Hall ..... Raleigh
Todd Jonathan Harbour ..... Sanford
Sue Ellen Harrington ..... Sanford
Denise Kaye Harris ..... Louisburg
Erica Benita Haywood ..... Raleigh
Michelle Rae Helman ..... Apex
Cynthia Cheryl Honrine ..... Salemburg
*Zach Watkins Howard ..... Oxford
Drew Goodwin Huggins ..... Lynchburg, VA
Kimberly Ann Huneycutt ..... Norwood

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

*Stephen Craig Hurt ..... Raleigh
Girish Pratap Karamchandani ..... Cary
**Thomas Lee Kelly ..... Knightdale
Stephen Wayne Kerr ..... Fayetteville
Leroy Buchanan Kodak ..... Jacksonville
Sharyn Leigh Lassiter ..... Raleigh
William VandeVenter Leaming, Jr. ..... Durham
†Melinda Jill Lester ..... Charlotte
*Kara Danielle Livingood ..... East Stroudsburg, PA
Stuart Bryan Long ..... Tarboro
*Catherine Dale Lutz ..... East Bend
†*Lisa Ann Lutz ..... Vale
Heather McLean Mason ..... Winston-Salem
Susan LeAnn Maxey ..... Reidsville
**Virginia Cupp McGuinness ..... Uniontown, PA
Kimberly Lynn McHenry ..... Greensboro
Heena Manish Mehta ..... Chapel Hill
Chanelle Michael ..... Charlotte
Laura Leigh Miller ..... Raleigh
**Marjorie Adele Mintz ..... Andrews
James Norman Montgomery ..... Roxboro
David Henry Mosier, Jr. ..... Raleigh
*Colleen Murray Oeters ..... Cary
Michael Joseph Oliver ..... Roper
***Tracie Dittmer Otto ..... Garner
Christopher Stacy Penny ..... Benson
Brian Cabot Philbeck ..... Raleigh
†Kevin Leuane Pickett ..... Beulaville
Cynthia Joy Pierce ..... Hertford
Mary-Beth Pleasant ..... Durham
†**Daniel Liston Purvine ..... Raleigh
James Gaston Rambeau ..... Fuquay-Varina
Gwendolyn Leigh Ray ..... High Point
†Phyllis Marie Ray ..... Apex
Jane West Reeves ..... South Boston, VA
Andrea Carole Roberts ..... Granite Falls
Mary Elizabeth Rogers ..... Raleigh
William Wayne Rogers ..... Raleigh
David Naim Sadi ..... Raleigh
†Gerard Allen Shoulars ..... Raleigh
Karen Marie Simonse ..... Raleigh
***Kevin Lamar Sink ..... Welcome
Roxanne Marie Sisson ..... Hilton, NY
Maria Antoinette Slade ..... Yanceyville
Elizabeth White Smith ..... Stoneville
*Kevin John Sook ..... Raleigh
Lorna Deneen Stanfield ..... Roxboro
*Stephen David Starnes ..... Raleigh
†Linda Kay Stephenson ..... Raleigh
Linda Yvette Stevens ..... Knightdale
James Douglas Taylor ..... Norlina
†Patricia Danae Taylor ..... Washington, DC
Patrick Bradley Vass ..... Wrightsville Beach
†Amy Carol Walker ..... Raleigh
H†Derek Grant Walker ..... Raleigh
Todd Noal Weinstein ..... Manascuan, NJ
†David Rudolph Wells, Jr. ..... Clayton
*Jin Lee Whangbo ..... Raleigh

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Kelly Elizabeth Williams ..... Madison
Pennie Marie Wright ..... New Bern

BACHELOR OF ARTS IN BUSINESS MANAGEMENT

Degrees Conferred May 11, 1991

Christi Leigh Adams ..... Rock Hill, SC
**Leslie Michele Alford ..... Raleigh
Jonathan Earl Allen ..... Wilmington
Karen Elizabeth Allen ..... Charlotte
Thomas Mitchell Alston ..... Georgetown, SC
Michelle Guinn Askins ..... Fayetteville
*Charles Ray Atkins ..... Greensboro
†**Amy Alexandra Autry ..... Wilmington
Christopher Lloyd Baccus ..... Raleigh
Albert Randall Baker ..... Claxton, GA
*Linda Carol Barclift ..... Winfall
Brenda Lee Barnes ..... Manteo
*Mary Elizabeth Barnhill ..... Greenville
†Belinda D'Atria Battle ..... Raleigh
†Thomas Edward Bennett ..... Rocky Mount
Eric Mitchell Bernstein ..... Raleigh
*Susan Elizabeth Bickel ..... Raleigh
†Matthew Charles Black ..... Piney Creek
Melody Ann Blackburn ..... St. Pauls
Joseph Eric Blake ..... Albemarle
Revella Lynn Blue ..... Fayetteville
King Oscar Bostrom III ..... Cary
Stacey Respess Bowen ..... Pantego
Catherine Leora Boyd ..... Maineville, OH
Krystina Melinda Boykin ..... Raleigh
Jason Chandler Branch ..... Winston-Salem
***James Richardson Britton ..... Asheville
Frederick John Bromenschenkel ..... Raleigh
Keith Sidney Brown ..... Raleigh
*Kim Sharon Brown ..... Danbury, CT
Malcolm Gerald Brown ..... Charlotte
***Erin Kathleen Burton ..... Sag Harbor, NY
*Elina Kristiina Cabrera ..... Raleigh
Daniel Jones Callihan ..... Farmville
Kurt Jeffrey Candler ..... Raleigh
Kathryn Jane Carpenter ..... West End
Lorena Elizabeth Cooke ..... Greensboro
Thomas Edward Cooper ..... Brick, NJ
Timothy Edward Creech ..... Knightdale
Lee Erik Dagenhart ..... Raleigh
Lynn Marie Daughtry ..... Smithfield
Pyke Cole Davis, Jr. ..... Burlington
Richard Earle deButts III ..... Raleigh
*Karol Anderson Degler ..... St. Petersburg, FL
†*Alejandra Del Valle Prieto ..... Cuernavaca, MORELOS
†Sean Francis Dinges ..... Raleigh
*Valerie Jean Dixon ..... Cary
Kathleen Mary Duffy ..... Upland, CA
†Sheri Lynn Dyer ..... Cary
Angela Horton Eaton ..... Franklinton

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Kelly Rose Edens ..... Fayetteville
Richard Stephen Klaus Eichinger ..... Raleigh
†Kenneth Robert Elliott ..... Fayetteville
†Sammy Earl Estridge III ..... Badin
Shawn DLugin Evans ..... Greensboro
Sonya Terrell Farrior ..... Rose Hill
***Mary Thomas Fedewa ..... Portland, MI
Chad Sherwood Finch ..... Wilmington
Tina Michelle Fink ..... Statesville
Timothy Ray Fox, Jr. ..... Durham
John Eric Froberg ..... Cary
**Donna Lynette Funderburk ..... Kannapolis
William Chase Gaston ..... Raleigh
†Paul Louis Ginocchio ..... Simsbury, CT
Joseph Charles Gove ..... Long Beach
Ivona Graboviecka ..... Raleigh
David Nile Gray ..... Raleigh
Julie Claudia Greene ..... Gastonia
†James Richard Griffith ..... Charlotte
*David Wesley Griswold ..... Knoxville, TN
†Raymond Craig Grush ..... Latrobe, PA
*Lawrence Paul Guess ..... Raleigh
Lisa Ann Guion ..... Aurora
Jill Lynn Hamric ..... Charlotte
Lydia Denise Hannah ..... Cary
†Kimberly Marie Haverlock ..... Raleigh
Melanie Leigh Hayworth ..... Kernsville
Andrea Evette Hearn ..... Riverdale, GA
Rochell Lynn Heininger ..... Springdale, PA
Jacqueline Smith Hering ..... Cary
†Danica Lynn Hershberger ..... Lodi, OH
†Todd Atwell Hillyard ..... Harrisonburg, VA
Cheryl Elizabeth Holland ..... Lincolnton
June Lynn Hollis ..... Kernersville
†*Michael Duane Hopper ..... Madison
Henry Cooper Horn ..... Charlotte
John Percy Huggins ..... Dillon, SC
Brian Douglas Hurley ..... Troy
Carol Jeanean Ingram ..... Rockingham
Bret Landon Jennings ..... Altavista, VA
Edwina Deloris Jones ..... Bronx, NY
Mark Overby Jones ..... Raleigh
Ronald Robert Jones, Jr. ..... Townsville
Victor Paul Jones ..... Raleigh
†Daniel Christopher Judge ..... Spring Lake, NJ
†Robert Warren Jurgens ..... Raleigh
Mary Katherine Keeney ..... Greensboro
Cindy Louise Keith ..... Fuquay-Varina
†Stephen Neil Key ..... Rocky Mount
Lisa Maria King ..... Charlotte
Ronald Syke King, Jr. ..... Raleigh
David Scott Klein ..... Raleigh
Thomas Lawrence Knight ..... Madison
Anne Beverley Knutson ..... Fayetteville
Karsten Kohlrausch ..... Apex
†David Joseph Koval ..... Pittsburgh, PA

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

†*David John LeCount ..... Jacksonville
†Melinda Jill Lester ..... Charlotte
Kristen Carol Lindberg ..... Charlotte
**Bradford Glen Lindsey ..... Hendersonville
Charles Kent Lovett ..... Raleigh
Allison Starr Lowe ..... Winston-Salem
*Anne Elizabeth Loyd ..... Raleigh
†*Lisa Ann Lutz ..... Vale
Craig Allan MacKinnon ..... Raleigh
†Christina Alison MacMillan ..... Southfield, MI
Jeffrey Lawrence Mahl ..... Wilmington
Christopher Joseph Mangano ..... Salisbury
Mark David Mangrum ..... Upper Marlboro, MD
Kely Colleen Manning ..... Cary
Myron Maurice Marsh ..... Charlotte
Darryl Sherrod Massenburg ..... Richmond, VA
Todd Edwin Massey ..... Statesville
Jennifer Lynn Mathers ..... Gambrills, MD
David Lee McCartney ..... Charleston, WV
*Melissa Angela McCoy ..... Charlotte
Brigid Merrit McDonald ..... Winston-Salem
Miranda JoLynda McFadden ..... Brooklyn, NY
**Sonya Lee McLamb ..... Raleigh
†Michael Blair McLean ..... King
**Cheryl Lynn Middleton ..... Upper Marlboro, MD
Julia Anne Milam ..... Winston-Salem
Charles Lawson Miller ..... Raleigh
Stephen Allen Mitchell .....
TracyLee Mitchelson ..... Charlotte
Raymond Eugene Moore, Jr. ..... Wilson
Sandra Carol Moore ..... Rocky Mount
Tracy Yvette Morris ..... Winston-Salem
Carla Renee Moss ..... Winston-Salem
Jeffrey Brenson Mudd ..... Raleigh
Gregory Scott Nesbitt ..... Hendersonville
Lien Thi-Hong Nguyen ..... Raleigh
†Jonathan Scott Nipper ..... Raleigh
David Eric Nobles ..... Fayetteville
Richard John Nortz ..... Harvard, MA
H†***Thomas Hervey Nunalee IV ..... Wilmington
†**Ronnie Steven Padgett ..... Garner
†Crystal Regina Peebles ..... Raleigh
Tracy Lynn Pennell ..... Lenoir
Charles Broadus Phillips, Jr. ..... Reidsville
†Kevin Leuane Pickett ..... Beulaville
Tracie Lee Pickler ..... Albemarle
Charles Meyer Pollard ..... Richmond, VA
†Wesley Thomas Pollard ..... Raleigh
William David Pore ..... Fuquay-Varina
†Lisa Lorraine Potts ..... Raeford
Kenneth Frederick Pruett ..... Winston-Salem
†**Daniel Liston Purvine ..... Raleigh
Michael Meredith Quickel, Jr. ..... Concord
†Phyllis Marie Ray ..... Apex
†Lisa van't Hoff Renwick ..... Arnold, MD
*Charles Robert Rhodes II ..... Greensboro

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

John Maxwell Richardson IV ..... Cary
†Tyler Blair Riggsbee ..... Raleigh
*Robert Young Rigsbee, Jr. ..... Durham
Page Albright Robertson ..... Wilmington
Mark Edward Robinson ..... Newton
Shonda Nicole Rodgers ..... Goldsboro
John Mark Rostan ..... Valdese
Amy Lynn Rouse ..... Garner
Sonya Yolanda Ruffin ..... Greenville
Jeanmarie Theresa Russo ..... Raleigh
Pamela Lee Sansbury ..... Rocky Mount
†Jeffrey Bryne Satterwhite ..... Raleigh
Jon Michael Schnyder ..... Hendersonville
Brian Rowe Settlemyre ..... Newton
Courtney Lynne Sever ..... Oakton, VA
Kathryn Seymour ..... Charlotte
Randy James Shackelton ..... Henderson
Landon Augustus Sheely ..... Wilmington
Dean Carroll Sholar ..... Maple Hill
†Gerard Allen Shoulars ..... Raleigh
*Sheila Singh ..... Carrboro
Kelly Ann Smith ..... Monroe
Randall Scott Snead ..... Cary
Anne Michele Sofo ..... Lexington, KY
†Lance Joseph Spacek ..... Flemington, NJ
†Anthony Brian Sapke ..... Asheville
*Christina Janet Stephens ..... Glenwood, MD
†Linda Kay Stephenson ..... Raleigh
Mia Lavisha Sterling ..... Charlotte
Anne Alexander Stewart ..... Gastonia
Laurie Anne Stiner ..... Raleigh
Stephen Douglas Stone ..... Middlesex
Styrling Singleton Strother ..... Cary
†Tracey Lynn Stuckrath ..... Annapolis, MD
†Thomas Edward Sweet ..... Annapolis, MD
†Patricia Danae Taylor ..... Washington, DC
Robert Douglas Taylor ..... Fayetteville
John William Tharin ..... Rocky Mount
***Lewis Anne Thomas ..... Greenville
Lloyd Rainer Thomas III ..... Cary
Paul Raymond Towlen ..... Bellport, NY
Jacek Tralik ..... Raleigh
Etienne Joseph Tron ..... Hickory
Lydia Christine Trott ..... Maysville
Michael David Turner ..... Huntersville
Beverly Gail Tysinger ..... Mt. Home AFB, ID
Erlinda Ann Victa ..... Raleigh
Rodney Dale Wade ..... Burlington
†Amy Carol Walker ..... Raleigh
H†Derek Grant Walker ..... Raleigh
Gregory Scott Walker ..... Waldorf, MD
*Kenneth Wayne Walker ..... Reidsville
Lakey Denise Walker ..... Raleigh

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Timothy Mitchell Warner ..... Raleigh
Troy Wayne Weeks ..... Raleigh
†David Rudolph Wells, Jr. ..... Clayton
†Lawrence Eugene West ..... Fayetteville
Richard Carroll Weston ..... Raleigh
Ladd Wayne Whicker ..... Winston-Salem
Melinda Sleeper White ..... Raleigh
Benjamin Whitehouse III ..... Greensboro
Cheri Rashawn Wilder ..... Franklinton
James Kilgore Wiley ..... Raleigh
Aaron Duane Wilson ..... Denton
Lisa Marie Wooster ..... Wilmington
H***Angela Paulette Wooten ..... Statesville

BACHELOR OF ARTS IN ECONOMICS

Degrees Conferred May 11, 1991

†**Amy Alexandra Autry ..... Wilmington
†Belinda D'Atria Battle ..... Raleigh
†Thomas Edward Bennett ..... Rocky Mount
Douglas Todd Buff ..... Morganton
*Catherine Dawn Buffington ..... Pottsville, VA
Paul Joseph Campion ..... Cary
†*Alejandra Del Valle Prieto ..... Cuernavca, Morelos
†Sean Francis Dinges ..... Raleigh
HLeza Lee Driscoll ..... Raleigh
†Kenneth Robert Elliott ..... Fayetteville
Scott Michael Frederick ..... Seattle, WA
†Paul Louis Ginocchio ..... Simsbury, CT
†Raymond Craig Grush ..... Latrobe, PA
†Kimberly Marie Haverlock ..... Raleigh
†Danica Lynn Hershberger ..... Lodi, OH
H Robert Lane Hicks ..... Raleigh
†Todd Atwell Hillyard ..... Harrisonburg, VA
†*Michael Duane Hopper ..... Madison
Peter Gregory Jackson ..... Pinehurst
†Daniel Christopher Judge ..... Spring Lake, NJ
†Robert Warren Jurgens ..... Raleigh
†Stephen Neil Key ..... Rocky Mount
†David Joseph Koval ..... Pittsburgh, PA
Joseph Thomas Laskey ..... Cary
†*David John LeCount ..... Jacksonville
†*Lisa Ann Lutz ..... Vale
†Christina Alison MacMillan ..... Southfield, MI
Jeane McCombs Mathis ..... Raleigh
Robert Thomas McDaniel ..... Greensboro
†Michael Blair McLean ..... King
Parke Stratton Morris ..... Chattanooga, TN
†Jonathan Scott Nipper ..... Raleigh
H†***Thomas Hervey Nunalee IV ..... Wilmington
†**Ronnie Steven Padgett ..... Garner
†Crystal Regina Peebles ..... Raleigh
†Wesley Thomas Pollard ..... Raleigh
†Lisa Lorraine Potts ..... Raeford
†**Daniel Liston Purvine ..... Raleigh

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

†Tyler Blair Riggsbee ..... Raleigh
†Jeffrey Bryne Satterwhite ..... Raleigh
Zorawar Singh ..... Raleigh
†Lance Joseph Spacek ..... Flemington, NJ
†Anthony Brian Spake ..... Asheville
†Thomas Edward Sweet ..... Annapolis, MD
†Derek Grant Walker ..... Raleigh
Christopher Shay Walsh ..... Longwood, FL
†David Rudolph Wells, Jr. ..... Clayton
†Lawrence Eugene West ..... Fayetteville

BACHELOR OF SCIENCE IN ECONOMICS

Degrees Conferred May 11, 1991

Bryan Trader Anderson ..... Cleveland Heights, OH
Christopher Scott Angel ..... Wilmington
Connie Lynn Cabaniss ..... Shelby
James David Layton ..... Rocky Mount
***Roberto Antonio Malouf ..... Guatemala City, CENTRAL AMERICA
Bart Onyewuchibeya Njoku-Obi ..... Durham
Virginia Frances Ray ..... Raleigh
Robert Allen Spohr ..... Raleigh
Philip Vogel ..... Boone
Robert Alan Watson ..... Springfield, VA

BACHELOR OF ARTS IN ENGLISH

Degrees Conferred May 11, 1991

Karen Jill Ankner ..... Green Pond, NJ
Sandra Lynn Baker ..... Morehead City
Theresa Kelly Benton ..... Brevard
Marcia Bernstein ..... Raleigh
**Doris Elizabeth Boseman ..... Roanoke Rapids
Charles Scott Brent ..... Winston-Salem
*Rebecca Virginia Byrd ..... Mt. Pleasant
H*Michael Christopher Byrne ..... Raleigh
Michaela Anne Carroll ..... Washington, DC
***Cathy Lane Chisholm ..... Asheboro
Catherine Fatica Compher ..... Raleigh
H*Meghan Kathleen Dacey ..... Wall, NJ
Meghan Amanda Day ..... Whiteville
Heather Bronwen Dees ..... Asheville
Paul Andrew DeWitt ..... Cary
Lisa Anne Florer ..... Orlando, FL
H***Gene Elizabeth French ..... Raleigh
John Robert Gamble, Jr. ..... Cary
H*James Carroll Gillen ..... Reston, VA
Henry Clayton Hammond, Jr. ..... Raleigh
**Teresa Lina Hausenflock ..... Raleigh
Mark Joseph Healy ..... Raleigh
H**Johanna Elaine Hicks ..... Roxboro
Cara Roberta Hobbs ..... Burlington
***Jocelyn Beth Hogrefe ..... Raleigh
**Kelly Leonard Horn ..... Newnan, GA
Jennifer Elaan Jessup ..... Greensboro

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

**Loretta Louise Johnson ..... Shelby
***Diana Creech Keever ..... Durham
**Dina Kostick Kim ..... Raleigh
H**Chiye Katherine Kojima ..... Raleigh
Elizabeth Anne Lambeth ..... Raleigh
David Alan Lewis ..... Goldsboro
Regina Liane Long ..... Greenville
Robert Benjamin Mace ..... Smyrna, DE
Deborah Jean Mathis ..... Charlotte
Bridget Butler Millsaps ..... New Hill
H**Gwendolyn Suzanne Moodispaw ..... Annapolis, MD
***Stephanie Dotson Moore ..... Kernersville
***Dorothy Olive Osborne ..... Stokesdale
*Virginia Lee Pittman ..... Garner
Charles Ducos Rhine ..... Raeford
Lori Ann Roghelia ..... Durham
H***Ann Herlocker Smith ..... New London
*Kimberly Diane Smith ..... Flemington, NJ
Clare Fischer Stone ..... Raleigh
H***Marisa Jane Teleki ..... Greenville
Gaston Rudolph Turner ..... Clayton
H***Milton Gay Tynch, Jr. ..... Edenton
Kenneth Andrew Winter ..... Burke, VA
*Joseph Preston Wofford III ..... Raleigh
Keneen S. Wood ..... Raleigh

BACHELOR OF ARTS IN FRENCH LANGUAGE AND LITERATURE

Degrees Conferred May 11, 1991

*Kimberly Anne Hopson ..... Wallingford, PA
William Earl Lewis, Jr. ..... Raleigh
Lisa Carole Smith ..... Arden

BACHELOR OF ARTS IN HISTORY

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Michael William Bollendorf, Jr. ..... Allentown, PA
Suzette Renee Bouchard ..... Cary
Jon Kevin Bowden ..... Austin, TX
Dagan LaMont Burrell ..... Hendersonville
William Charles Codd ..... Torrance, CA
Travis Scott Conner ..... Asheville
Richard Archer Croxton III ..... Winston-Salem
*Donald Lee Cuffman ..... Galion, OH
Jennifer Leigh De Hertogh ..... Cary
Matthew Brian Dehritz ..... Patchogue, NY
Suzanne Carole Farmer ..... Charlotte
Donald Lee Fox II ..... Pinehurst
Denise Gwyn Hager ..... Denver
Lisa Dianne Carter Jelinek ..... Chadbourn
Cornelia Lynch Johnson ..... Greensboro
Sven Alexander Johnson ..... Wilson
**William Marvin Lindsay III ..... Fayetteville
*James Joseph Lowe ..... Elkin
**Gail Michele Metz ..... Reading, PA
Elizabeth Rachel Norris ..... Ayden
Katherine Adrianne Parker ..... Raleigh
Ricky Jonathan Perry ..... Windsor
William Frederick Piermattei ..... Manasquan, NJ

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Ellen Therese Reilly ..... Raleigh
Lee Philip Sadler ..... Denver
***Harriet Jean Stout ..... Sanford
Maria Torres Timberlake ..... Raleigh
Eric Douglas Wenzl ..... Charlotte
**Brian Keith Whitaker ..... Kernersville

BACHELOR OF SCIENCE IN HISTORY

Degrees Conferred May 11, 1991

Michael Barbot Covington ..... Washington
*Robert Blain Newton III ..... Morehead City

BACHELOR OF ARTS IN MULTI-DISCIPLINARY STUDIES

Degrees Conferred May 11, 1991

*Amanda Helen Bosch ..... Raleigh
***Betty Davis Byrd ..... Cary
Scott Allen Cissel ..... Woodbine, MD
Lisa Myra Gustincic ..... Advance
†***Kimberly Carol Hamm ..... Greensboro
Barbara Wright Hodges ..... Raleigh
*Carita Birgit Lindstrom ..... Kankaanpaa, FINLAND
Shenita Paulette Mangum ..... Robersonville
†*Edward Dale McDaniel ..... Raleigh
Daren Burke Melson ..... Raleigh
Freddie Troy Morgan, Jr. ..... Albemarle
Laura Virginia Peeler ..... Charlotte
†Tammie Renee Hicks Picarella ..... Angier
Kathleen Pillsbury ..... Winston-Salem
*Pamela Martin Schmotzer ..... Raleigh
**Susan Lamadrid Sellers ..... Greensboro
Brian Elliott Smith ..... Raleigh
Veronica Rosezetta Townes ..... Wake Forest
*Franklin Stainback Winn ..... Raleigh

BACHELOR OF ARTS IN PHILOSOPHY

Degrees Conferred May 11, 1991

Paul Richard Ambrose ..... Akron, OH
Anna Lori Ballew ..... Greensboro
*Sarah Ann Levitt ..... Garner
*Joel Jacob Lindsey ..... Stuart, VA
Brian Wayne Wood ..... Raleigh

BACHELOR OF ARTS IN POLITICAL SCIENCE

Degrees Conferred May 11, 1991

*Mary Alisha Amburgey ..... Bryantown, MD
James Darin Arnold ..... Louisburg
John Andrew Auman ..... Benson
Michelle Devone Baldwin ..... Whiteville
John Ashley Barnhill ..... Lake Waccamaw
Barbara Ann Bateman ..... Graham
Mary Lee Beasley ..... Youngsville
William McClease Bell III ..... Raleigh
Amy Michele Berkley ..... Durham
Barbra Allison Bliden ..... Stone Ridge, NY

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Tyrell Cameron Britt ..... Robbins
***Karen Frances Castello ..... Racine, WI
Susanne Elizabeth Conrad ..... Lewisberry, PA
Thomas Arnold Dameron ..... Durham
**Steven Dale Draper ..... High Point
*Michael Glenn Dupree ..... Raleigh
Valerie Suzanne Everette ..... Raleigh
*Robert Wall Ewing ..... Potomac, MD
Boyd Scott Farmer ..... Ennice
Derek Vaughn Gatling ..... Bronx, NY
Brenda Denise Gibson ..... Sumter, SC
Joel Talmadge Gibson ..... Clemmons
***Harold William Goforth, Jr. ..... Asheville
Kelley LeAnne Goodsell ..... Vienna, VA
Ashely Ann Hamilton ..... Raleigh
Christopher Wayne Hagwood ..... Garner
Robert Andrew Harris ..... High Point
*Rodney Gene Hasty ..... Greensboro
Charles Mitchell Hatchett III ..... Asheville
Dean Alexander Hayes ..... Jamesville
Douglas Ray Holbrook, Jr. ..... Raleigh
Jennifer Anne Jansen ..... Mechanicsburg, PA
Angela Lynette Jeffers ..... Charlotte
*Kimberly Ann Jenkins ..... New Town, CT
Mark Williams Johnson ..... Wilmington
Reginald Macrone Jones ..... Tarboro
Paul Mark Kelly ..... Greenville
Jennifer Robin Kiser ..... Winston-Salem
**Melissa Karien Kuver ..... Federal Way, WA
*Lisa Ann Marcus ..... Rockford, IL
Janet Elizabeth Martin ..... Raleigh
Christopher Grady Mathews ..... Raleigh
Colleen Sue McCloskey ..... Raleigh
*David Alexander Merriman ..... Raeford
Kathryn Diane Mittelstadt ..... Jacksonville
Karen Michelle Montgomery ..... Winston-Salem
Jeffrey Brake Morgan ..... Houston, TX
*Travis Kristin Morton ..... Reidsville
Timothy Odell Myers ..... Denton
†Sharon Kay O'Dell ..... Hickory
Laura Anne Olson ..... Cary
Richard John Pailthrope, Jr. ..... Raleigh
Howard Neil Pate ..... Fayetteville
***Richard William Patella ..... Winston-Salem
†Margaret Louise Patterson ..... Raleigh
Tressa Denise Paul ..... Orlando, FL
Mary Beth Phillips ..... Charlotte
**John Bryan Plumlee ..... Pittsburg, KS
*Leslie Noelle Powell ..... Cary
Edward Landon Roy ..... Lynchburg, VA
Shubhra Jawahar Sawardeker .....
Clifton Edward Snyder ..... Charlotte
John Edward Somerindyke ..... Fayetteville
Anthony Dean Stiller ..... Salisbury
*Marnie Alicia Stokes ..... Tarboro
**Kevin Winston Stroud ..... Pink Hill
Natalie Joleen Taylor ..... Lena, IL
**Donica Tolee Thomas ..... Dumfries, VA
Darlene Elizabeth Toney ..... Roosevelt, NY

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Kimberly Anne Trawitz ..... Fairport, NY
Edward C. G. Tyree III ..... Norfolk
Derek Tyrone Valentine ..... Fayetteville
Tara Elizabeth Valentine ..... Andover, NJ
**Kimberly Ann Wallis ..... Alexandria, VA
Patrick Jorge Weninger ..... Fayetteville
Christopher Senter Wilson ..... Clinton
Deanna Lynne Winston ..... Charlotte
Keith Andre Wright ..... Bronx, NY

BACHELOR OF SCIENCE IN POLITICAL SCIENCE

Degree Conferred May 11, 1991

Jonathan Andrew Overbay ..... Roanoke, VA

BACHELOR OF ARTS IN SOCIOLOGY

Degrees Conferred May 11, 1991

***Melanie Ann Allison ..... Buda, TX
Christine Marie Brown ..... Raleigh
William Ross Carew III ..... Newark, DE
Bridget Stewart Daniel ..... Apex
Cynthia Ann Edwards ..... Charlotte
Angela Kay Greene ..... Selma
**Laura Kinsey Greene ..... Winston-Salem
Tara Lynn Hahner ..... Charlotte
Elizabeth Garland Hartsoe ..... Roanoke Rapids
***David Carl Hockett ..... Pleasant Garden
Antonio Isaac-Monteiro ..... Bissau, Guinea-Bissau
Betsy Sue Kaplan ..... Raleigh
Douglas Robert Kline ..... Silver Spring, MD
*Teresa Renee Matthews ..... Selma
Melissa Caroline Monroe ..... Greenville
Melissa Kaye Parker ..... Whiteville
Thomas Garland Parker ..... Lillington
Jennifer Dominica Pina ..... Fayetteville
Kim LaVonda Rogers ..... Raleigh
*Gregory Louis Russell ..... Raleigh
Barbara Scott Rysanek ..... Raleigh
Kimberly Paris Sakas ..... Wilson
Paige Lee Thompson ..... Morehead City
Mark Franklin Vincent ..... Raleigh
Lamia Hany Younes ..... Raleigh

BACHELOR OF ARTS IN SPANISH LANGUAGE AND LITERATURE

Degrees Conferred May 11, 1991

Margaret Frances Binkley ..... Wilmington
Deana Jane Cunningham ..... Cherryville
Jorn Schummacher Haneke ..... Ponce, PUERTO RICO
*Thomas Alex Huffstetler ..... Garner
Patricia Lynn Jarrett ..... Denver
†Sharon Kay O'Dell ..... Hickory
†Kimberly Denise Payne ..... Waldorf, MD
†Tammie Renee Hicks Picarella ..... Angier
†Lisa van't Hoff Renwick ..... Arnold, MD
**Stacey Marlise Richardson ..... Brandon, FL

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF ARTS IN COMMUNICATION

Degrees Conferred May 11, 1991

Erika Krimminger Adcock ..... Raleigh
Shannon Benée Allen ..... Raleigh
Justine Marie Anastasoff ..... Cape Elizabeth, ME
Lisa-Leigh Constance Bacogeorge ..... Charlotte
Johnnie Caswell Baker, Jr. ..... Wrightsville Beach
Leigh Vondus Baker III ..... Garner
Mary Melissa Ballantine ..... Southport
Rufus Samuel Becoat, Jr. ..... Raleigh
†Matthew Charles Black ..... Piney Creek
Robert Dean Black, Jr. ..... Raleigh
Robert Luther Brake, Jr. ..... Battleboro
Lindsay Elizabeth Brecher ..... Atlanta, GA
Natalie Jo Britt ..... Clinton
Margaret Balynda Brown ..... Raleigh
Susan Katherine Bryant ..... Cary
James Christopher Bua ..... Wilmington
*Amy Michelle Butner ..... Arlington, VA
Matt Douglas Byers ..... Cincinnati, OH
Shuris Alberta Campbell ..... Southern Pines
***Josefina Barcia Carpenter ..... La Habana, Cuba
William Kevin Carter ..... Asheville
Mark Wesley Cartner ..... Clemmons
James George Catenis ..... Raleigh
Robin Rian Chamberlain ..... Mandeville, LA
Terri Lynne Chapin ..... Charlotte
Kathey Anne Clark ..... Whichita Falls, TX
Susan Jeanette Coley ..... Stem
Morgan Scott Collie ..... Spring Hope
Terresa Diana Corl ..... Gold Hill
Peter Jeffrey Crooks ..... Greensboro
Joyce Renee Cutler ..... Winston-Salem
Jaree Danielle Dalton ..... Raleigh
Danielle Marie Deakin ..... Rutherfordton
Ann Pullen Dickens ..... Rocky Mount
Michael Frawley Doran ..... Millburn, NJ
Michael Ross Doyle ..... Rocky Mount
Gina Renee Falcone ..... Florence, SC
Tarsha Anne Ferguson ..... Saint Pauls
Page Elizabeth Fesperman ..... Paoli, PA
Thomas Mark Fleming ..... Lexington
***Thelma Jane Foehl ..... Raleigh
Darlene Renee Ford ..... Newport News, VA
*Amy Suzanne Frank ..... Greensboro
Carolyn Elizabeth Gatling ..... Hampton, VA
Tammy Denetta Gilliam ..... Arden
Kimberly Dawn Godwin ..... Dunn
*Marlo Billie Goldstein ..... Carrboro
*Marsha Finley Graf ..... El Paso, TX
Towana Viola Green ..... Southern Pines
Robert Kirk Griffin ..... Tuskegee, AL
Elayne Stephanie Gross ..... Elverson, PA
Janette Martha Haanskorf ..... Cary
Edward James Hackim, Jr. ..... Akron, OH
Angela Leigh Hale ..... Wendell
Durwood Gregory Hargis ..... Clayton

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Deborah Darlene Harrington ..... Asheboro
Molly Stewart Harris ..... Raleigh
Victoria Lynette Harrison ..... Seneca, SC
Kalyn Cecile Heavner ..... Smithfield
***Lori Renee Hill ..... Asheboro
Erin Catherine Himes ..... Charlotte
Brian Mitchell Hitt ..... Charlotte
Susan Elizabeth Hodges ..... Fairfax, VA
Daniel Reed Humphrey ..... Raleigh
Suzanne Faye Ireland ..... Fayetteville
Derick Anthony Johnson ..... Jamaica, NY
Nancy Carolyn Jones ..... Wilmington
Emma Pauline Kauffman ..... Raleigh
Kerrie Christine Kessing ..... Kittyhawk
Michelle Ann Kime ..... Burke, VA
Gregory William Kirkpatrick ..... Raleigh
Joseph Montague LaMuraglia ..... Teaneck, NJ
*Carla Ann Lucas ..... Spring Hope
Jacqueline Bonita Massenburg ..... Littleton
Candace Aileen Maultsby ..... Garner
Gary Porter McDonald ..... Kinston
*Susan Marshall McGuire ..... Raleigh
*Sean Joseph McIlhinney ..... Cherry Hill, NJ
Courtney Ann McVey ..... Manhattan, NY
*Anna Jill Miller ..... Clinton
Kathryn Elizabeth Miller ..... Brevard
David Ward Mitchell ..... Durham
Michelle Susan Mooney ..... McLean, VA
Christine Anderson Moore ..... Raleigh
Karen Jean Moore ..... Raleigh
Megan Montgomery Mortimer ..... Londonderry, NH
***Rosemarie Jarosinski Murphy ..... Baltimore, MD
Linda Rose Nall ..... Mooresville
Colleen Kelly Nelson ..... Knightdale
Davy Trent Nethercutt ..... Raleigh
David Brian Oakley ..... Greensboro
**Kelli Elizabeth Partin ..... Raleigh
†Margaret Louise Patterson ..... Raleigh
†Kimberly Denise Payne ..... Waldorf, MD
Michael Emory Pegram ..... Shelby
Amy Leigh Pizzimenti ..... Franklin, PA
Preston Timothy Poag ..... Dalton, GA
Mark Alexander Ragland ..... Greensboro
***Hanya Hani Redwan ..... England, UNITED KINGDOM
Lori Elizabeth Resch ..... Wayne, NJ
*Michelle Lee Robbins ..... Raleigh
Dennis Bernard Rogers ..... Raleigh
Mary Kaye Roland ..... Raleigh
Howard Loring Rose, Jr. ..... Pantego
Michelle Lisa Rotella ..... Seminole, FL
Susan Elizabeth Ruff ..... Springfield, VA
Robert Barrie Russell, Jr. ..... New London, CT
Dan Fulton Sanderson ..... Orlando, FL
*Katharine Irene Sands ..... Arlington, VA
*Christine Chiemi Seichi ..... Sama, JAPAN
Dana Michelle Shipman ..... Whiteville
Meredith Amanda Shuford ..... Lincolnton

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Christy Michelle Smith ..... Kannapolis
*Frank McKay Smith ..... Highlands
Jennifer Marie Spicchiali ..... Raleigh
David Michael Stella ..... Cary
*Carrie Virginia Strickler ..... Greensboro
Mary Lisabeth Strowd ..... Pittsboro
†Tracy Lynn Stuckrath ..... Annapolis, MD
Garret Arthur Sueltz ..... Rolesville
Mary Elizabeth Tatum ..... Winston-Salem
Richard Badger Telfair III ..... Raleigh
Whitney Dianne Thompson ..... Burlington
Erica Beth Upton ..... Clinton
*John Atwood Ward II ..... Sunbury
Elizabeth Craven Weeks ..... Winston-Salem
Miriam Lynn Weinstein ..... Lumberton
Sharon Marie White ..... Charlotte
Andy Renault Williams ..... Nashville
Christopher Alan Williams ..... Creedmoor
Denise Carolyn Williams ..... Raleigh
Lauren Elizabeth Wolfe ..... Raleigh
Catherine Melissa Wood ..... Charlotte
Sherri An Yelton ..... Charlotte
Stephanie Lynn Yelton ..... Goldsboro

BACHELOR OF SOCIAL WORK

Degrees Conferred May 11, 1991

*Karen Gail Angle ..... Cary
Teresa Shaw Davenport ..... Raleigh
Mary Dobelstein ..... Cleveland, OH
Dawn Elizabeth Farrell ..... Charlottesville, VA
Christine Louise Flanagan ..... Charlotte
*Dana Michelle Gatlin ..... Englewood, CO
LeAnn Marie Godsey ..... Hendersonville
Lisa Annette Green ..... Shelby
**Charlotte Elizabeth Haithcox ..... New Hill
**Mara Pauline Hudock ..... Raleigh
***Cornelia Ellis Jaeger ..... Raleigh
Julie Cannon Johnson ..... Smithfield
**Sylvia Louise Mantovani ..... Raleigh
Julie Elizabeth Morris ..... Clemmons
Martha Graham Petrey ..... Gastonia
Darren Samuel Rogers ..... Kernersville
Nehal Shukla ..... Charlotte
Monica Lynn Teasley ..... Washington, DC
Caroline Anne Trippe ..... Charlotte
*Jill Michelle Turner ..... Greensboro
**Paige Haley Walker ..... Cary
Daryl Alan Washington ..... Bailey's Crossroad, VA

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

College of Physical and Mathematical Sciences

BACHELOR OF ARTS IN CHEMISTRY

Degrees Conferred May 11, 1991

***Benjamin Stribling Alexander ..... Hendersonville
†James Fitzgerald Best ..... Roxboro
Frederick Lloyd Bone ..... Rocky Mount
†Steven Claude Cardon ..... Raleigh
James Patrick Cekanor ..... Darien, IL
†***Joseph Kevin Craig ..... Apex
†**Charlene Kay Eller ..... Kernersville
†Jennifer Renee Elliott ..... Durham
Tracey Marchette Garner ..... Greensboro
William Regis Krisulewicz ..... Raleigh
†**Cynthia Lyn Lowry ..... Raleigh
†**Keith Eric Petrofsky ..... St. Louis, MO
†Katherine Anne Sharp ..... Aiken, SC
†*William Fletcher Talbot ..... Raleigh
†***Ellen Maria Williams ..... Staley
†Brian Keith York ..... Kinston
*Woosung Yun ..... Seoul, KOREA

BACHELOR OF SCIENCE IN CHEMISTRY

Degrees Conferred May 11, 1991

***Mark Daniel Aldous ..... Burlington
*James Scott Anderson ..... Charlotte
David Vernon Barringer ..... Hickory
Scott Allen Bewley ..... Cary
Donna Spivey Braswell ..... Rocky Mount
*Jefferson Gail Bumgarner ..... Garner
*Elizabeth Cates ..... Raleigh
H***Laura Beth Darien ..... Simpsonville, SC
Ronald Lee Earp ..... Burlington
Eric Todd Flynn ..... Brevard
***Wesley Alan Frye ..... Matthews
Robert Michael Hamm ..... Charlotte
Debra Kaye Hutcheson ..... Burgaw
Frithjof Horst Kuntze ..... Charlotte
H***Steven Philip Manuli ..... Greensboro
Robert Ernest Roberts IV ..... Shelby
H**John Howard Sanford, Jr. ..... Willow Springs
*Lisa Ann Shamon ..... Peoria, IL
Eileen Marie Winchester ..... Durham
H***Teresa Raye Zuber ..... Shallotte

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF ARTS IN GEOLOGY

Degree Conferred May 11, 1991

David Earl Jones ..... Jarrettsville, MD

BACHELOR OF SCIENCE IN MATHEMATICS

Degrees Conferred May 11, 1991

Cynthia Marie Arboit ..... Carolina Beach
H*Scott Allen Bales ..... Elon College
†Julia Kathryn Brande ..... Greensboro
Derrick LeRoi Brown ..... Whiteville
Derron Tyler Connor ..... Morganton
H***Luke Adam Higgins ..... Hope Mills
Karen Raye Israel ..... Winston-Salem
Gregory Lee Jefferson ..... Fort Bragg
**Eden Rowe Martin ..... Greensboro
**Todd Wesley McMasters ..... Charlotte
*Heidi Kay Moore ..... Reidsville
Mary Deanne Mustian ..... Raleigh
Lida Maria Pilotta ..... Vicenza, Italy
Jerry Richard Pressley II ..... Charlotte
*Rebecca Ann Ray ..... Lithonia, GA
***Wendy Ellen Sense ..... Cary
***Robert Edmund Singleton, Jr. ..... Raleigh
**Nanette Rae Smart ..... Snow Hill
***Pamela Jane Vehling ..... St. Paul, MN
***Donna Marie Wray ..... Pacific Grove, CA

BACHELOR OF SCIENCE IN METEOROLOGY

Degrees Conferred May 11, 1991

Ronald Joseph Bartholomew ..... Rolesville
Thomas Gales Bowen, Jr. ..... Winston-Salem
Christopher James Fehr ..... Riva, MD
Catherine Anne Gruce ..... Stratford, CT
Todd Michael Malfa ..... Hampton, NJ
***Richard Anthony Neuherz ..... Cary
†Robert Blain Newton III ..... Morehead City

BACHELOR OF SCIENCE IN PHYSICS

Degrees Conferred May 11, 1991

James Kenneth Gobble ..... Raleigh
Derek Roger Holtman ..... Raleigh
Stuart Rex Jefferys ..... Kernersville
**Claude Frederick Lumpkin ..... Burlington
H***Adam Leonard Lyon ..... Cary
†Michael Austin Netzer, Jr. ..... Raleigh
*William Henry Rowland, Jr. ..... Kinston
†Brent Stephen Stone ..... Raleigh

BACHELOR OF SCIENCE IN STATISTICS

Degrees Conferred May 11, 1991

Karen Michele Beamon ..... Candler
†Julia Kathryn Brande ..... Greensboro
Kevin Ashley Kirby ..... Charlotte
***Laura Erin Kirkland ..... Lumberton
Anne Marie Kuehl ..... Forest City
Katherine Anne McAuliffe ..... Silver Spring, MD

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

College of Textiles

BACHELOR OF SCIENCE IN TEXTILE ENGINEERING

Jointly administered by the College of Textiles and the College of Engineering. See page 13 under College of Engineering for a listing of the graduate seniors in the jointly administered department.

Degrees Conferred May 11, 1991

*Andy Maurice Barefoot, Jr. ..... Knightdale
***Jeffrey Allen Funderburk ..... Charlotte
**Alan Edward Wright ..... Charlotte

BACHELOR OF SCIENCE IN TEXTILE AND APPAREL MANAGEMENT

Degrees Conferred May 11, 1991

William Edward Austin, Jr. ..... Charlotte
Steven Kinard Benson ..... Winston-Salem
Jose Gonzalez Carpio ..... Manila, Philippines
**Mary Catherine Coleman ..... Wilmington
***Aliza LaFond Diggs ..... Hampton, VA
Britton Farrell Goodrich ..... Gastonia
Robert Lee Harrington III ..... Charlotte
Rodney Lee Hockaday ..... Raleigh
John Edward Jennings ..... Arapahoe
Bettina Ines Lange ..... Lima, Peru
Bradley Carr Loflin ..... Monroe
Margaret Ann Lydon ..... Charlotte
*Randall Lee McKinney ..... Raleigh
George Collins McLarty III ..... High Point
Andrea Lynne McNamee ..... Martinsburg, WV
Edward James Meeker ..... Raleigh
Patrick Timothy Murphy, Jr. ..... New Bern
George Robert Perkins III ..... Sanford
Charles Alan Ritchie ..... Greensboro
Meredith Overton Robinson ..... Richmond, VA
Regina Baldwin Speed ..... Dallas
Bobby Lee Stewart, Jr. ..... Gastonia
Michael Anthony Strickland ..... Raleigh
Jonathan Scott Stuart ..... Fuquay-Varina
Fred Michael Teachey ..... Wilmington
Sherry Annette Thomas ..... Pittsboro
*Aimee Ruth Weinberg ..... Greensboro

BACHELOR OF SCIENCE IN TEXTILE CHEMISTRY

Degrees Conferred May 11, 1991

Joan Denise Ball ..... Garner
Regina Michelle Dula ..... Hickory
Anthony Scott Koonce ..... New Bern

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

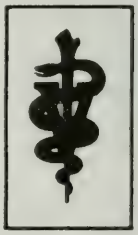
Jamie Lynn Lamm ..... Wilson
†Connie Ellen Morton ..... Albemarle
Barbara Jo Stone ..... Clinton, MD
Patrick Arthur Whitford ..... Ernul

BACHELOR OF SCIENCE IN TEXTILES

Degrees Conferred May 11, 1991

Dewey Altman Cabe ..... Hillsborough
Courtney McDevitt Fields ..... Greensboro
Stephanie Alexandra Hanner ..... Cary
**Lisa Rachael Hennigar ..... Chapel Hill
***Amy Lynne Rader ..... Durham

COLLEGE OF VETERINARY MEDICINE



DOCTOR OF VETERINARY MEDICINE

Degrees Conferred May 11, 1991

Donna Gail Anderson ..... Kannapolis
Stephen Elgin Angell ..... Raleigh
Elizabeth Scott Atwell ..... Morganton
Tiffany Charise Barnhill ..... Clarendon
Sean Joseph Barrett ..... Cary
Nathan Christopher Batts ..... Raleigh
Audrey Thabet Beam ..... Raleigh
Karen Rozema Bohon ..... Apex
Daniel Browne Borders ..... Shelby
Timothy Neil Boyte ..... Carthage
Christopher Cushing Brooks ..... Raleigh
Helen Venita Brown ..... Greensboro
Linda Ann Bruce ..... Greenville
William J. L. Bryant ..... Raleigh
David Michael Cole ..... Charlotte
Lysa Paige Deaton ..... Cornelius
John Upshur Dennis ..... Raleigh
Christine Chelf Faircloth ..... Fayetteville
Shelley Fitzgerald ..... Durham
Sarah Anne Foley ..... Cary
Donna Lee Gallant ..... Rocky Point
Tony Lee Glover ..... High Point
Thomas Smith Golding ..... Durham
Rebecca Ann Gore ..... Raleigh
Elizabeth Ellen Gough ..... Winston-Salem

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Pamela Jean Grasso ..... Lewisburg, PA
Elaine Gregg ..... Pittsboro
Debra Lee Hagerman ..... Raleigh
Joan Marie Hardin ..... Fayetteville
Catherine Whitaker Harrelson ..... Bahama
Jan Fletcher Hawkins ..... Jacksonville
Selby Blake Hawley ..... Raleigh
Sharon Ann Heins ..... Cary
Abigail Winifred Hollowell ..... Charlotte
Kathleen Olivia Holmes ..... Raleigh
Perry Herbert Jameson III ..... Newport News, VA
Donna Elaine Jenkins-Hill ..... Newland
Madeleine Sophie Jiamachello ..... Fayetteville
Richard DeVane Kirkman ..... Pleasant Garden
Teresa Lynn Klatt ..... Cary
Christine Maria Kolmstetter ..... Durham
Brenda Smith Lam ..... Raleigh
Len Edward Murray ..... Pembroke
Paul Bernard Nader ..... Raleigh
Marjorie Lynn O'Neill ..... Winston-Salem
Linda Miller Overcash ..... Waynesville
Daniel Lee Patterson ..... Hillsborough
Susan Elizabeth Piscopo ..... Raleigh
Lisa Rose Radwan ..... Raleigh
Stanley Kent Robinson ..... Startown
Anne Mary Scheer ..... Raleigh
Martha Battle Shannon ..... Rocky Mount
Alice Louise Smith ..... East Bend
Scott Tyler Smith ..... Cary
Kathryn Elizabeth Spragins ..... Roanoke Rapids
Tonya Ann Stewart ..... Coats
Deborah Kemp Stine ..... Durham
Winona McLees Stockard ..... Greensboro
Mary Susan Stuart ..... Cary
Diane Bernadette Tortorice ..... Raleigh
Joanna Simons Tysor ..... Pittsboro
Barbara Anne Walton ..... Raleigh
Richard Scott Wassell ..... Charlotte
Joseph Todd Weaver ..... Bahama
Dana Allison Wilson ..... Pinetown
Susan Gaspar Wishner ..... Hillsborough

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

GRADUATE DEGREES

Master's Degrees

Candidates for Graduate Degrees, May 11, 1991

MASTER OF AGRICULTURE

Mary Margaret Tilley ..... Mount Airy

MASTER OF ARCHITECTURE

Ana Carvalho Borges ..... Rio de Janeiro, Brazil
Mary Frances Bunker ..... Falmouth, MA
Maria Katherina Hunt ..... Rutherfordton
Pamela Wadley Jones ..... Long Lake, NY
Epifanio Louis Pazienza ..... Raleigh
Stephen Antonio Sutton ..... Kinston
Stephen Joseph Zetts ..... Youngstown, OH

MASTER OF BIOMATHEMATICS

Patricia Luann Phillips ..... Sidney, AR

MASTER OF CHEMISTRY

Sonia Cooper Weeks ..... Raleigh

MASTER OF CIVIL ENGINEERING

Steve Derek Carpenter ..... Arden
Shunyi Chen ..... Taichung, Taiwan, Republic of China
Lee-Kuo Edward Hsiao ..... Shin-Dien, Taiwan, Republic of China
Jerry Jay Jensen ..... Raleigh
William LeRoy Lyke ..... Cary
Archie Cameron Patterson ..... Sanford
Dharma Putra ..... Tabanan, Indonesia
Jorge Quintal ..... Yucatan, Mexico
Robert Bruce Smith, Jr. ..... Clinton, NJ
Alicia Elizabeth Speight ..... Greenville

MASTER OF ECONOMICS

Paul Wayne Ashworth ..... Cary
Gary William Bushman ..... Apex
Jack Andrew Chambless ..... Hugo, OK
Mohamed Feddoul ..... Rabat, Morocco
Qi Li ..... Beijing, People's Republic of China
Laura Lynn Martin ..... Garden Grove, CA
Kevin Patrick McNew ..... Perkins, OK
Esnath Musaya Mtonga ..... Lusaka, Zambia
Andre Federal Palmer ..... Myrtle Beach, SC

Martin Dixon Parker ..... Tarboro
René Agustin Pilarte ..... Managua, Nicaragua
Anthony Rezitis ..... Kato Achaia, Greece
Motoyuki Sakai ..... Saitama, Japan
Glenn Ray Walters, Jr. ..... San Antonio, TX
Viljoen Williams ..... Ombalantu, Namibia

MASTER OF EDUCATION

Adult and Community College Education

Merrill Lawton Davis ..... Pikeville
Evelyn Davis Raper ..... Goldsboro

Agricultural Education

Stuart Brent Daughtery ..... Clinton
Susan Denise Spicer ..... Forest City

Curriculum and Instruction

Kimberley Ann Allen ..... Raleigh
Theresa Karen Ives Audet ..... Orange Park, FL
Allison Yeargan Kuhns ..... Raleigh
Barbara Hanna Olson ..... Cary
Sarah Beth Rodgers ..... Raleigh
Linda Ann Ostrum Shearin ..... Raleigh

Educational Administration and Supervision

Mary Mallette Castleberry ..... Raleigh

Guidance and Personnel Services

Henrietta McCall Adams ..... Laurinburg
Fran Sapir Black ..... Cary
Catherine Ann Brawley ..... Durham
Elisa Fortenberry DeBoskey ..... Charlotte
Alice Hobson Dudley ..... Raleigh
Mazie Dunn ..... Raleigh
Eugenia Leigh Harris ..... Raleigh
Tony Maurice Langley ..... Rocky Mount
Darryl Kevin Lester ..... Marion, SC
Barbara Anne Luckey ..... Durham
Robert Glenn McLain, Jr. ..... Albemarle
Cassandra Versteeg Mitchell ..... Raleigh
Judith Germaux Page ..... Pittsburgh, PA
Barbara Fields Painter ..... Apex
Jeanne Mitchell Pearce ..... Raleigh
Anona Patrice Smith ..... Newport News, VA

Health Occupations Teacher Education

Jane Gaffney Brown ..... Raleigh
Barbara Jeanne McCullough ..... West End
Elizabeth Ward Paddock ..... Raleigh

Mathematics Education

Rebecca Cowan Arnold ..... Raleigh
Susan Plietchwait Bradley ..... Rocky Mount
Ambre Michelle Dickerson ..... Oxford
Lisa Cheryl Peoples ..... Henderson
Linda Diane Woodard ..... Princeton

Middle Grades Education

Carolina Anne Jacobs ..... Durham
Jeffrey Scott Moss ..... Chapel Hill
Mary Morris Quinn ..... Apex

Science Education

Mary Elizabeth Bradbury ..... Cary
Teresa Falco Coleman ..... Sierra Madre, CA
Ann Strickler Cruikshank ..... Bradenton, FL
John Charles Hall ..... Sanford
Julie Ann Waters ..... Bath

Special Education

David Jay Cantrell ..... Louisville, KY
Sheryl Ellen Key ..... North Wilkesboro
Lorenzo Steven Melton ..... Raleigh
April Renee Stephens ..... Hillsborough

Training and Development

Sherry Jean Cheek ..... Coleridge
Signe Yolanda Couceiro ..... Raleigh
Todd Alan Harris ..... Charlotte
Sally Gravely Parker ..... Sanford

MASTER OF ENGINEERING

James Clinton Ellison ..... Brevard
Sharon Campbell Peek ..... Biloxi, MS
Joseph Roger Sidlowski ..... Greensboro

MASTER OF FORESTRY

James Anthony Jeuck ..... Monroe, NY
Jesse Fuller Jones IV ..... Colorado Springs, CO

MASTER OF INTEGRATED MANUFACTURING SYSTEMS ENGINEERING

Sudhir Pal Aneja ..... New Delhi, India
Mary Jane Gnadt ..... Milwaukee, WI
Luz Celeste González ..... Guaynabo, Puerto Rico
Elaine McCorkle Jaros ..... Cary
Raphael Sebastian Parambi ..... Foster City, CA
Mark Alan Seelhammer ..... St. Cloud, MN
Chih-Kun Shih ..... Changhua, Taiwan, Republic of China
Yi-Lih Tien ..... Kaohsiung, Taiwan, Republic of China
Wen-ta Philip Tseng ..... Taipei, Taiwan, Republic of China

MASTER OF LANDSCAPE ARCHITECTURE

Samuel Frederick Dennis, Jr. ..... Charlotte
Susan Lynn Gular ..... Doylestown, PA
Anderson Cooke Hensley ..... Raleigh
Thomas Randall Kagan ..... Mendham, NJ
Min-Jay Kang ..... Tou-Cheng, Taiwan, Republic of China
Terri Anne Lefler ..... Albemarle
Lisa Rochelle Marshbourne ..... Clearwater, FL
Joseph Michael Ortosky, Jr. ..... Durham
John Daniel Roberts ..... Fruit Heights, UT
Francis Joseph Trzuskowski ..... Wilmington, DE
Jay Warren Walden ..... Vienna, VA
Richard Norris Wilson, Jr. ..... Northport, MI

MASTER OF MATERIALS SCIENCE AND ENGINEERING

Gretchen Maerker Adema ..... Durham
Hoan Duy Le ..... Saigon, Vietnam

MASTER OF MECHANICAL ENGINEERING

Robert Edward Choate III ..... Chesapeake, VA

MASTER OF NUCLEAR ENGINEERING

Patrick Rex Murphy ..... Lisle, IL

MASTER OF PRODUCT DESIGN

Jung-Huang Chen ..... Tainan, Taiwan, Republic of China
Vincent Lee Haley ..... Columbus, OH
Moon Sook Kim ..... Greensboro
Robert Roger Lasson ..... Raleigh
Kathleen Ann O'Toole ..... Cary
Steven Michael Slaton ..... Raleigh
Ayda Utku ..... Durham
Marta Eugenia Valle ..... San Salvador, El Salvador

MASTER OF PUBLIC AFFAIRS

Nancy Charlene Astrike ..... Fayetteville
Christine Anne Beal ..... Raleigh
Martha Randall Browning-Mandell ..... Raleigh
Jane W. Clark ..... Durham
Cynthia Pitt Edmondson ..... Pinetops
William Allen Hawks ..... Wise
Deborah Davis Menius ..... Cary
Kay Marie Sage Oney ..... Bluefield, WV
Teresa Elizabeth Piner ..... Wendell
Mark Michael Sabula ..... Raleigh
Diana Carpenter Sparrow ..... Durham
Teresa Taylor Stickels ..... Raleigh

MASTER OF RECREATION RESOURCES ADMINISTRATION

Harrison Langdon Gruman ..... Birmingham, AL
Barbara Turbeville Hydrick ..... Columbia, SC
Jennifer Lynn Jones ..... Moundsville, WV
Karen Jean Layer ..... Alachua, FL

MASTER OF SOCIOLOGY

Sheila Lyn Johns ..... Raleigh
Annette Louise Murray ..... Rockville, MD

MASTER OF STATISTICS

Hueychuan Chou ..... Taichung, Taiwan, Republic of China
Rachid Drissi El-Bouzaidi ..... Rabat, Morocco
Anne M. Hatch ..... Rosemont, PA
Tae Yoon Lee ..... Seoul, Korea
Roman Tseng ..... Taipei, Taiwan, Republic of China

MASTER OF TEXTILES

Suhail Arap Filho ..... Sao Paulo, Brazil
Jeffrey Scott Dugan ..... Asheville

Georgette Laila Siparsky ..... Denver, CO
Nicola Tamburrino ..... Dallas, TX

MASTER OF ARTS DEGREES

Archival Management

William Bruce Alley ..... Mesford, OR
Janet Gail Blanchard ..... Greenville
John Marc Campbell ..... Shelby
John Lloyd Durham ..... Greensboro
Kelley Ann Lawton ..... Statesville
Kathleen Isabel Smith ..... Whitehall, PA
Edgar Lee Taylor ..... Knightdale

English

Kurt Michael Benrud ..... Cary
Robin Luana Bott ..... Kaneohe, Hawaii
Karin Evans ..... Knoxville, TN
Alan Roscoe Ford ..... Clayton
Janet Jenkins Kimzey ..... Raleigh
Mary Joan Opyr ..... Raleigh
Ida Patricia Pleasants ..... Cary

History

Amelia Barnum Dees-Killette ..... Goldsboro
Craig Sean McConnell ..... Westminster, CO
Mark Thomas Taylor ..... Somersworth, NH

Political Science

Charles James Garland, Jr. ..... Marina, CA
Erin Elizabeth O'Donnell ..... El Paso, TX

MASTER OF SCIENCE DEGREES

Aerospace Engineering

Lance Hamilton Benedict ..... McLean, VA
Brian Ray Hollis ..... DuBois, PA
Dean Arthur Kontinos ..... Ft. Myers, FL
Stanley St. Clair Smeltzer III ..... Salisbury

Agricultural Education

Mark Gene Allen ..... Raleigh

Animal Science

Glenn Dale Detweiler ..... Hickory

Biological and Agricultural Engineering

Walter Lamonte Hankins ..... Brown Summit

Botany

Brian Bartlet Shank ..... Marion, IN

Chemical Engineering

Eric Charles Carlson ..... Northboro, MA
Valerie Gayle Martin ..... Huntsville, AL

Chemistry

Huiyan Lu ..... Junan, People's Republic of China

Civil Engineering

John Robert Dorney ..... Green Bay, WI
Lokesh Garg ..... Chandigarh, India
Craig Eric Harwood ..... Raleigh
Paul Wilson Kelly ..... Charlotte
Nakseok Kim ..... Seoul, Korea
Luis Ernesto Rey Balarezo ..... Lima, Peru
Lisa Kay Spainhour ..... Raleigh

Computer Engineering

Robert Wayne Haulbrook ..... Lexington, SC
Kishore Ram Jotwani ..... Guttenberg, NJ
Barry Kyan Kyu ..... Raleigh
William Woody Rolland II ..... Southern Pines
Lo-Ting Wang ..... Taipei, Taiwan, Republic of China
Tien-Shi Yen ..... Raleigh

Computer Science

Alan Belles Anderson ..... Raleigh
Paul Thomas Barham ..... Wake Forest
Donald Elmer Carver ..... Hudson
Richard Clifton Edwards ..... Raleigh
Andre Norman Fredette ..... Fitchburg, MA
John Henry Goyer ..... Raleigh
Cornelis Fredericus Hendriks ..... Woerden, The Netherlands
Sheng-Fen Hu ..... Taipei, Taiwan, Republic of China
Wanda Elaine Jones ..... Fayetteville
Garrison Quay Kenney ..... Raleigh
John Carl King ..... Adair, OK
Keith Francis Reck ..... Woodstock, VT
Manojit Sarkar ..... Kalyani, India
Sook-Cheng Sim ..... Penang, Malaysia

Crop Science

Gregory Burnett Baldwin ..... Raleigh
David Bernard Fischer ..... Ottawa, KS
Gregory Darin Goins ..... Greensboro
U Tin Htut ..... Yezin, Myanmar
Noah Nathan Ranells ..... New York, NY
Mary Melissa Rosebrock ..... Whiteland, IN
Ralph Lloyd Warren, Jr. ..... Mount Olive

Electrical Engineering

Randall Greer Alley ..... Raleigh
Clifton Gene Barfield ..... Raleigh
Daniel Charles Cato ..... Hillsborough
John Terence Collinson ..... Raleigh
Steven Bruce Goldberg ..... Lynbrook, NY
Greg Alan Hames ..... Sand Creek, MI
Jeffrey Gordon Kerr ..... Orlando, FL
Ambalavaner Logenthiran ..... Colombo, Sir Lanka
Joseph Britt McGinn, Jr. ..... Huntersville
Michael Dean Moore ..... Havelock
Kenneth William Norton ..... Norfolk, VA
James L. Patrick, Jr. ..... Cary
Thomas Albert Petersen ..... Chatham, NJ
Steven Glen Skaggs ..... Raleigh

Mustafa Kemal Sönmez ..... Ankara, Turkey
Kelley Robert Field Stockton ..... Jacksonville, FL
David Shawn Trotter ..... Lewisville
Reeder Noah Ward ..... Mineral Wells, WV
Robert Eugene Weidner ..... Charlotte
Daniel Edward Wessell ..... Hillsborough

Entomology

Matthew Tracy Johnson, Jr. ..... Raleigh
Catharine Mary Mannion ..... Los Angeles, CA
Mark Ambroze Wolff ..... Baltimore, MD

Food Science

Debra Lynne Daum ..... State College, PA
Allen Britton Thomas ..... Bristol, VA

Forestry

Keith Jehan Jayawickrama ..... Colombo, Sri Lanka
Yecai Liu ..... Guangzhou, People's Republic of China
Luis Fernando Osorio Arango ..... Medellin, Colombia

Guidance and Personnel Services

Merry Carol Ward ..... Rose Hill
Abraham-Avi Elnekave ..... Haifa, Israel

Genetics

Angela Louse Galey ..... Fayetteville

Horticultural Science

Stuart Alan Walters ..... Dalton, GA
Kimberly Ann Williams ..... Great Bend, KS

Industrial Engineering

Michael Lee Douglas ..... Waldoboro, ME
Tarek Mohamed El-Hadidi ..... Cairo, Egypt
Mark Layne Harris ..... Anoka, MN
Stephen Mark Wimmer ..... Charlotte
Qingping Zhou ..... Shanghai, People's Republic of China

Management

Ricardo Wanderley Annicchino ..... Capivari, Brazil
Eric Stephen Barbour ..... Bristol, TN
Hazim Hashim Dahir ..... Raleigh
Joachim Gruss ..... Arden
Jeffrey Neal Hunter ..... Boone
Josef Jaeger ..... Munich, Germany
Donald Allen King ..... Ft. Lauderdale, FL
James Joburn Leonard ..... Rockingham
Carolyn Mandel Morton ..... Chapel Hill
Jeffrey Mukamal ..... Whiteville
Gary Jerome Roach ..... Cary
Vicky Ruffin ..... Kenly
Douglas McGregor Stewart ..... Derwood, MD
Eslie Cornelius Sykes, Jr. ..... Wake Forest
Yiling Ereen Wu ..... Taipei, Taiwan, Republic of China
Jinqguo Yiin ..... Taipei, Taiwan, Republic of China
Susan Leake Young ..... Angier

Marine, Earth and Atmospheric Sciences

Mark Steven Preddy ..... Concord
Zion Shay-Feng Wang ..... Taipei, Taiwan, Republic of China

Materials Science and Engineering

Michelle Lawrence Hartsell ..... Beaufort
Jallepally Ravi ..... Raleigh

Mathematics

Paul S. Davenport III ..... Winston-Salem
Gregory Alan Gibson ..... Sylva
Darren Michael Welch ..... North Vernon, IN

Mathematics (Applied)

Tiwanda Michele Allen ..... Suitland, MD
Kaushik Banerjee ..... Raleigh
Sharon Arnita Robinson ..... Fayetteville
Chyuan-huei Thomas Yang ..... Taipei, Taiwan, Republic of China

Mechanical Engineering

Michael Lamar King ..... Raleigh
Kyle Warren Loseke ..... Raleigh
Charles Anthony Mills ..... Greenville
Elizabeth Anne Reid ..... Matthews
Kevin Hunter Vorhees ..... Raleigh
James Lee Walls ..... Oak Ridge, TN

Nuclear Engineering

Rifat Mohammed Khalel Alchalabi ..... Westfield, NJ
Christa Elizabeth Boman ..... Aiken, SC
Mahmoud Mohamed Abd-Alla Heiba ..... Alexandria, Egypt

Nutrition

Walter Lee Briley ..... Robersonville

Operations Research

Lawrence Dekonti Koffa ..... Raleigh
Eleni Moustou ..... Thessaloniki, Greece
Ruey-Lin Sheu ..... Tainan, Taiwan, Republic of China
Tianmin Zhang ..... Qingdao, People's Republic of China

Physics

John Vincent LaBrasca ..... Philadelphia, PA

Physiology

Steve Weldon Breeding ..... Raleigh
Marilyn Louise Patton ..... Asheville

Plant Pathology

Melanie Jane Hord ..... Winston-Salem

Psychology

Ruth Limbrick Green ..... Pittsboro
Michael David Sandin ..... Greensboro

Recreation Resources Administration

Mary Jane Terry ..... Hillsborough

Soil Science

Jonathan Wallace Hooper ..... Seattle, WA
Kim Haley Ludovici ..... Endicott, NY

Technical Communication

Laura Chick Hopkins ..... Fayetteville

Textile Chemistry

Jennifer Williams Warren ..... Raleigh

Textiles

Mary Anne Boyle ..... Presque Isle, ME
Akhil Kumar ..... New Delhi, India

Toxicology

Catherine Louise Crawford ..... Chapel Hill

Wildlife Biology

Philip Douglas Manor ..... Ochopee, FL
Armando Pizzoni-Ardemani ..... Padova, Italy
John Daniel Stanton III ..... Windham, ME

Wood and Paper Science

James Edward Bradbury ..... Lufkin, TX

Zoology

Donna Lynn Barker ..... Morehead City
Bradley Fields Blackwell ..... Greensboro
Costadinos Chrysnthos Mylonas ..... Famagusta, Cyprus
Julie Martin Rochelle ..... Ramseur
Zheng-yu Xue ..... Harbin, People's Republic of China

Doctor of Education Degrees

Paula Kristen Berardinelli, Occupational Education
Jersey City, New Jersey
Dissertation: Using Dubin's Theory Building Methodology to Construct a Model of the Impact of Management Training. (Under the direction of Linda S. Dillon and James L. Burrow.)

Kathryn Jones Brake, Guidance and Personnel Services
Rocky Mount, North Carolina
Dissertation: The Effect of Role-taking Experience on the Moral Development and Behavior of Elementary School Males Identified as Discipline Problems. (Under the direction of Edwin R. Gerler.)

Mary Frances Howard-Hamilton, Guidance and Personnel Services
Alton, Illinois
Dissertation: The Effects of a Deliberate Psychological Education Program on the Moral Reasoning, Identity Formation and Achievement Motivation among Gifted Adolescents. (Under the direction of Herbert A. Exum and Norman A. Sprinthall.)

David Neal Johnson, Adult and Community College Education
Raleigh, North Carolina
Dissertation: Motivational Factors Related to Curriculum Students' Enrollment in North Carolina Community Colleges. (Under the direction of Ronald W. Shearon.)

Charles Canham Linnell, Industrial Arts Education
Boone, North Carolina
Dissertation: Determining the Stages of Concern of North Carolina Technology Education Teachers with the Curriculum Change from Industrial Arts to Technology Education. (Under the direction of William J. Haynie III and Richard E. Peterson.)

Pearl Johnson Logan, Occupational Education
Orangeburg, South Carolina
Dissertation: Examining the Characteristics of Resettled Migrant Farm Workers and Factors That Influence Them to Leave the Migrant Stream. (Under the direction of Linda S. Dillon and Edgar I. Farmer.)

Heriberto Noel Martínez, Adult and Community College Education
Rio Piedras, Puerto Rico
Dissertation: Attitudes and Beliefs of 4-H Volunteers toward Matters of Concern in the North Carolina 4-H Program and Volunteer Values. (Under the direction of Richard T. Liles and R. David Mustian.)

Larry Dale Parker, Guidance and Personnel Services
Wilmington, North Carolina
Dissertation: Improving the Success of Academically High-risk First-year College Students through a Differentiated Deliberate Psychological Education. (Under the direction of Don C. Locke.)

Dennis Ray Sherrod, Higher Education Administration
Bailey, North Carolina
Dissertation: Analysis of Doctoral Student Flow: An Application of Markov Chains with Absorbing States. (Under the direction of Raymond G. Taylor.)

Rudolph Tripp, Adult and Community College Education
Raleigh, North Carolina
Dissertation: An Assessment of the Educational Needs and Interests of Inmates in the Polk Youth Institution, North Carolina Department of Corrections. (Under the direction of Scipio A. J. Colin and Herbert A. Exum.)

Philip Fitch Vincent, Curriculum and Instruction
Hickory, North Carolina
Dissertation: The Teaching Ethics as a Means to Facilitate Moral Development in Gifted Adolescents. (Under the direction of John F. Arnold.)

Melvin Walter Webb II, Higher Education Administration
Burnsville, North Carolina
Dissertation: Development and Testing of a Theoretical Model for Determining Causal Relationships among Factors Related to Freshman Year Persistence at Four-year Residential and Commuter Colleges. (Under the direction of William B. Harvey.)

Doctor of Philosophy

Jorge Alberto Abad, Plant Pathology
Huancayo, Peru
Dissertation: Molecular Characterization and Detection of the Capsid Protein Gene from Two Serologically Distinct Strains of Sweetpotato Feathery Mottle Virus (SPFMV). (Under the direction of James W. Moyer.)

Hisham Ibrahim Abdel-Fattah, Civil Engineering
Alexandria, Egypt
Dissertation: The Effect of Large Deformations on the Fracture Behavior of Materials Subjected to Axial and Shear Loads. (Under the direction of Shuaib H. Ahmed and Paul Z. Zia.)

Jassim Abbas Al-Saadi, Aerospace Engineering
Bryson City, North Carolina
Dissertation: Wall Interference Calculation in a Transonic Wind Tunnel with Discrete Slots. (Under the direction of Fred R. DeJarnette.)

Kathleen Doubek Barboriak, Chemistry
Milwaukee, Wisconsin
Dissertation: A New Route to Homochiral Cyclopropanes via Optically Active Epoxides. (Under the direction of Samuel G. Levine.)

James Lewis Boyce, Science Education
Swansboro, North Carolina
Dissertation: Change in the Cognitive Structure of Community College Students as the Result of a Laboratory Experience. (Under the direction of Jack H. Wheatley.)

David Matthew Bubeck, Crop Science
Clarion, Iowa
Dissertation: Molecular and Biometric Evaluation of Gray Leaf Spot and Southern Corn Leaf Blight Resistance in Maize. (Under the direction of Major M. Goodman and Paul H. Sisco.)

Marc Allan Buchanan, Soil Science
Santa Cruz, California
Dissertation: Carbon and Phosphorus Cycling in No-till and Reduced Chemical Input Maize Agroecosystems: Experimental and Simulation Analysis. (Under the direction of Larry D. King.)

Julio César Calvo-Alvarado, Forestry
San Jose, Costa Rica
Dissertation: Predicting Mean Annual Runoff and Suspended Sediment Yield in Rural Watersheds in North Carolina. (Under the direction of James D. Gregory.)

Chung Jacob Chen, Mechanical Engineering
Taipei, Taiwan, Republic of China
Dissertation: Optimal Control Problems of Linear and Nonlinear Heat Transfer. (Under the direction of M. Necati Özisik.)

Quiyun Chen, Botany
Shima, Longhai, People's Republic of China
Dissertation: Signal Transduction in Carrot Cells: The Role of Inositol Phospholipids. (Under the direction of Wendy F. Boss.)

Woei-Kae Chen, Computer Engineering
Taipei, Taiwan, Republic of China
Dissertation: Theoretical and Experimental Approaches for the Hypercube Embedding Problem. (Under the direction of Dharma P. Agrawal and Matthias F. M. Stallmann.)

Yoonsung Cho, Materials Science and Engineering
Seoul, Korea
Dissertation: The Amorphization of Intermetallic Compounds by Mechanical Alloying/Milling. (Under the direction of Carl C. Koch.)

Hye-Yeong Chun, Marine, Earth and Atmospheric Sciences
Chuncheon, Korea
Dissertation: Role of a Critical Level in a Shear Flow with Diabatic Forcing. (Under the direction of Yuh-Lang Lin and Sethu Raman.)

Robert Alan Cline, Physics
Boiling Springs, North Carolina
Dissertation: Experimental Density Matric Determination for H($\underline{n}$=2) Atoms Emerging from Collisions between H^+ (20-100 keV) and He. (Under the direction of John S. Risley.)

Nancy Holmes Cottrell, Economics
Toano, Virginia
Dissertation: The Total Demand Response of U. S. Wheat Exports. (Under the direction of Paul R. Johnson.)

Marc Anthony Cubeta, Plant Pathology
Wilmington, Delaware
Dissertation: Protection of Cucumber Seedlings from Damp-off with Binucleate *Rhizoctonia* spp.: Ecology and Genetic Characterization of Binucleate *Rhizoctonia* spp. (Under the direction of Eddie Echandi.)

Catherine Ann Culver, Food Science
North Tarrytown, New York
Dissertation: Application of Immobilized Digestive Enzyme Assay Fluidized-bed Reactors and Characterization of Their Digests. (Under the direction of Harold E. Swaisgood.)

Pauline Patricia David, Horticultural Science
Kingston, Jamaica
Dissertation: Effects of Applied Humic Acid on Yield, Growth, Nutrient Accumulation/Content in Selected Vegetable Crops and Soil Interactions That Reduce Their Effectiveness. (Under the direction of Douglas C. Sanders.)

Craig Steven Eckel, Entomology
Camden, New York
Dissertation: Response of Soybean, *Glycine max* (L.) Merrill, Yields to Corn Earworm, *Helicoverpa zea* (Boddie) Larval Infestations. (Under the direction of Julius R. Bradley, Jr. and John W. Van Duyn.)

Martha Keehner Engelke, Sociology
Greenville, North Carolina
Dissertation: Maternal Competence in Mothers of High Risk Infants. (Under the direction of Maxine P. Atkinson.)

Erick Cajetan Marian Fernandes, Soil Science
Nairobi, Kenya
Dissertation: Alley Cropping on Acid Soils. (Under the direction of Charles B. Davey.)

Thomas Gene Filloon, Statistics
Fort Dodge, Iowa
Dissertation: Improved Curve Estimation with Smoothing Splines through Local Cross-validation. (Under the direction of Douglas Nychka.)

Michael Scott Fitzner, Crop Science
Greensboro, North Carolina
Dissertation: Plant Breeding Strategies for the Enhancement of Peanut Drought Tolerance. (Under the direction of Johnny C. Wynne.)

Terence Rhett Fitz-Simons, Statistics
Raleigh, North Carolina
Dissertation: Fitting a Lognormal Distribution to Air Quality Data Observed with Measurement Error. (Under the direction of H. Robert van der Vaart.)

Laurel Anne Fix, Toxicology
Dallas, Texas
Dissertation: Studies of the Metabolism and Mode of Action of Chlorfluazuron in the Eastern Spruce Budworm, *Choristoneura fumiferana.* (Under the direction of Walter C. Dauterman.)

Christen Mark Frankle, Physics
Raleigh, North Carolina
Dissertation: Parity Nonconservation for Neutron Resonances in ^{81}Br and ^{232}Th. (Under the direction of Gary E. Mitchell.)

Samir Abdelmonsef Ghanem, Nuclear Engineering
Alexandria, Egypt
Dissertation: Monte Carlo Simulation of the Response of the Gamma-ray Backscatter Litho-density Tool for Oil Well Logging. (Under the direction of Robin P. Gardner and Kuruvilla Verghese.)

Ameen Frederick Ghannam, Chemistry
Ardsley, New York
Dissertation: Mechanistic Study and Synthetic Application of the Aliphatic Reverse Brook Rearrangement. (Under the direction of Russell J. Linderman.)

David Marshall Graves, Chemistry
Hickory, North Carolina
Dissertation: Part I: Oxidation of Fluoroalkyl-substituted Carbinols. Part II: Approaches to an Electrophilic Carbonyl Ylide Synthon. (Under the direction of Russell J. Linderman and Marion L. Miles.)

Bennett Ross Groshong, Electrical Engineering
Oak Ridge, North Carolina
Dissertation: Eddy Current Image Restoration: Recovering the Input to a Nonlinear System, Given Noisy Output. (Under the direction of Wesley E. Snyder.)

Mark Edmund Guckin, Electrical Engineering
Middletown, Connecticut
Dissertation: Tangent Frame Surface Reconstruction of Range Images. (Under the direction of Wesley E. Snyder.)

Myra Johnson Halpin, Science Education
Durham, North Carolina
Dissertation: Strategies Students Use to Solve Chemistry Problems. (Under the direction of Jack H. Wheatley.)

Linda Joan Harris, Microbiology
Kitimat, British Columbia, Canada
Dissertation: Development of a Novel Paired Starter Culture System for Sauerkraut Consisting of Nisin-resistant *Leuconostoc mesenteroides* and Nisin-producing *Lactococcus lactis.* (Under the direction of Henry R. Fleming and Todd R. Klaenhammer.)

Mary Sue Hay, Psychology
Hendersonville, North Carolina
Dissertation: Task Performance as a Function of Self-efficacy, Attributions and Task Preview Information. (Under the direction of Samuel B. Pond III.)

Carolyn Lois Herman, Sociology
Asheville, North Carolina
Dissertation: Dimensions of Religiosity and Life Satisfaction among Episcopalians. (Under the direction of Elizabeth M. Crawford.)

Thomas Henry Hildebrandt, Computer Engineering
Raleigh, North Carolina
Dissertation: Optical Recognition of Handprinted Chinese Characters Using an Improved Neural Network Model. (Under the direction of Wentai Liu and Mark W. White.)

Scott Douglas Holland, Aerospace Engineering
Newport News, Virginia
Dissertation: A Computational and Experimental Investigation of a Three-dimensional Hypersonic Scramjet Inlet Flow Field. (Under the direction of John A. Perkins.)

Gregg Eric Homanics, Animal Science
Fayette City, Pennsylvania
Dissertation: Changing the Genetic Control of Lipid Metabolism by the Insertion of Additional Genes Using Transgenic Technologies. (Under the direction of Clement L. Markert.)

Jih-Min Hsu, Mechanical Engineering
Kaohsiung, Taiwan, Republic of China
Dissertation: A Three-dimensional Finite Element Model of Metal Cutting. (Under the direction of John S. Strenkowski.)

Whei-Neen Hsu, Fiber and Polymer Science
Taipei, Taiwan, Republic of China
Dissertation: Design of Photofade Resistant Synthetic Dyes. (Under the direction of Harold S. Freeman.)

Chen Huang, Mechanical Engineering
Beijing, People's Republic of China
Dissertation: Optimal Design of Thermoelectric Devices. (Under the direction of Clarence J. Maday.)

Cheng-Hung Huang, Mechanical Engineering
Tainan, Taiwan, Republic of China
Dissertation: Inverse Heat Transfer Problems. (Under the direction of M. Necati Özisik.)

Jacqueline Mindy-Mae Hughes-Oliver, Statistics
Cincinnati, Ohio
Dissertation: Estimation Using Group-testing Procedures: Adaptive Iteration. (Under the direction of William H. Swallow.)

Hyeongtag Jeon, Materials Science and Engineering
Seoul, Korea
Dissertation: Initial Reactions, Surface and Interface Morphologies, Phase Transition and Epitaxial Growth of $TiSi_2$ Formed by Thin Film Reaction in Ultrahigh Vacuum. (Under the direction of Jagdish Narayan and Robert J. Nemanich.)

Princy Alice Jesudason, Entomology
Trichy, India
Dissertation: Juvenile Hormone Metabolism in the Hemolymph and Selected Tissues of the Tobacco Hornworm, *Manduca sexta* (L.) (Lepidoptera:Sphingidae). (Under the direction of Ernest Hodgson and R. Michael Roe.)

Leslie Walker Joyce, Psychology
Raleigh, North Carolina
Dissertation: Managerial Functions as Measures of Performance in Developmental Assessment Centers. (Under the direction of Samuel B. Pond III and Paul W. Thayer.)

Dongwoon Jung, Chemistry
Chung-Nam, Korea
Dissertation: Structural and Electronic Properties of Low-dimensional Organic and Inorganic Metallic Compounds. (Under the direction of Myung-Hwan Whangbo.)

Tarek Mohamed Khalil, Statistics
Cairo, Egypt
Dissertation: A Study of the Doubly Geometric Processes, Stationary Cases and a Nonstationary Case. (Under the direction of Bibhuti B. Bhattacharyya.)

Dojoong Kim, Mechanical Engineering
Andong, Korea
Dissertation: Dynamics and Optimal Design of High Speed Automotive Valve Trains. (Under the direction of Joseph W. David.)

Inchan Kim, Mechanical Engineering
Seoul, Korea
Dissertation: Macroscopic Behavior and Morphology of Random Media. (Under the direction of Salvatore Torquato.)

Insun Kim, Aerospace Engineering
Seoul, Korea
Dissertation: Numerical Investigation of Unsteady Supersonic Cavity Flowfield with Passive Control. (Under the direction of Fred R. DeJarnette and Ndaona Chokani.)

Yong Hoon Kim, Computer Engineering
Seoul, Korea
Dissertation: Representation, Recognition and Reconstruction of 3-D Objects using 3-D Images. (Under the direction of Ren C. Luo.)

Gregory Lawrence Klunder, Chemistry
Manassas, Virginia
Dissertation: Interferences of Cobalt in Flame Atomic Spectroscopy. (Under the direction of Charles B. Boss.)

James Edward Koster, Physics
Waldorf, Maryland
Dissertation: A Test of Time Reversal Invariance with Polarized Neutrons and Aligned ^{165}HO. (Under the direction of Christopher R. Gould.)

Shanthi Radha Krishnan, Science Education
Madras, India
Dissertation: Conceptual Change in Chemistry through Cooperative Problem Solving. (Under the direction of Ann C. Howe.)

Fu-Yung Lai, Computer Engineering
Hsin-Chu, Taiwan, Republic of China
Dissertation: Performance Evaluation of High Speed Networks. (Under the direction of Arne A. Nilsson and Harry G. Perros.)

Margaret Ann Lamb, Animal Science
Tigard, Oregon
Dissertation: Evaluation of Mating Systems Involving Five Breeds for Integrated Beef Production Systems. (Under the direction of O. Wayne Robison.)

Yamina Lansari, Materials Science and Engineering
Algiers, Algeria
Dissertation: Low Temperature Growth and Doping of Hg-based II-VI Multiple Quantum Well Structures by Molecular Beam Epitaxy. (Under the direction of Abdel A. Fahmy and Jan F. Schetzina.)

Michael Patton Lawton, Toxicology
St. Helena, California
Dissertation: Cloning and Expression of the Pulmonary and Hepatic Forms of the Flavin-containing Monooxygenase. (Under the direction of Ernest Hodgson and Richard M. Philpot.)

Dae-Weon Lee, Biological and Agricultural Engineering
Kyongsangbuk-do, Korea
Dissertation: A Robotic and Vision System for Locating and Transferring Container Grown Tobacco Seedling. (Under the direction of W. Fred McClure.)

Heng Liu, Electrical Engineering
Taipei, Taiwan, Republic of China
Dissertation: Laser Assisted Growth of Optoelectronic Devices. (Under the direction of Salah M. Bedair.)

Hari Prasad Mahadevan, Chemical Engineering
Bombay, India
Dissertation: A Theoretical and Experimental Study of Protein Precipitation by Nonionic Polymer. (Under the direction of Carol K. Hall.)

Stephen Mark Marson, Sociology
Lumberton, North Carolina
Dissertation: The Utility of a Marxian Framework for Sociology of Aging. (Under the direction of Maxine P. Atkinson.)

Daniel Francis McCaffrey, Statistics
Denver, Pennsylvania
Dissertation: Estimating Lyapunov Exponents with Nonparametric Regression and Convergence Rates for Feedforward Single Hidden Layer Networks. (Under the direction of A. Ronald Gallant.)

Allen Warren McDowell, Economics
Wilmington North Carolina
Dissertation: A Neoclassical Model for the Aggregate Supply of Monetary Services. (Under the direction of Douglas Fisher.)

William James Meyer, Microbiology
Erie, Pennsylvania
Dissertation: Structural and Antigenic Analysis of Native and Conformationally Altered Sindbis Virions Using Monoclonal Antibodies. (Under the direction of Robert E. Johnston.)

David John Michael, Operations Research
Oxford, Ohio
Dissertation: The Optimal Representation of Activity Networks as Directed Acyclic Graphs. (Under the direction of Salah E. Elmaghraby and Matthias F. M. Stallman.)

Kathi Ann Middendorf, Psychology
Raleigh, North Carolina
Dissertation: The Effects of Group versus Individual Questioning and Directive versus Nondirective Questioning on Juror Voir Dire Responses. (Under the direction of James E. R. Luginbuhl.)

Charles Andrew Miller, Mechanical Engineering
Raleigh, North Carolina
Dissertation: Effective Properties of Heterogeneous Materials and Behavior of Reactive Solids. (Under the direction of Salvatore Torquato.)

Peter Michael Muriana, Food Science
Bridgeport, Connecticut
Dissertation: Lactacin F, a Bacteriocin Produced by *Lactobacillus acidophilus*: Purification of the Active Peptide and Cloning, Expression and Nucleotide Sequence of the Structural Gene (*laf*). (Under the direction of Todd R. Klaenhammer.)

Ramin A. Nobakht, Electrical Engineering
Raleigh, North Carolina
Dissertation: Performance Optimization of Digital Communication Systems by Annealing Algorithms. (Under the direction of Sasan H. Ardalan and David Van den Bout.)

Franc Edward Noel, Computer Engineering
Durham, North Carolina
Dissertation: Dynamic Resource Allocation Using Wavelength Division Multiplexed Channels in Token-ring Local Area Networks. (Under the direction of Arne A. Nilsson and J. Benjamin O'Neal.)

Moustafa El-Sayed Tawfick Oraby, Nuclear Engineering
Alexandria, Egypt
Dissertation: The Physics of a Combined Prompt Gamma-ray and Neutron Log and Its Applications in Measuring Porosity. (Under the direction of Robin P. Gardner and Kuruvilla Verghese.)

Hatice Örün Öztürk, Electrical Engineering
Istanbul, Turkey
Dissertation: Analysis of 1-D and 2-D Perfect Reconstruction Transmultiplexers as Duals of Sub-band Coders. (Under the direction of Winser E. Alexander.)

Tai-Jee Pan, Electrical Engineering
Taipei, Taiwan, Republic of China
Dissertation: Robotic Motion Planning in a Dynamic Environment with Moving Obstacles. (Under the direction of Ren C. Luo.)

Mark Jay Perry, Electrical Engineering
Manitowoc, Wisconsin
Dissertation: Performance Modelling of Automatic Call Distributors. (Under the direction of Arne A. Nilsson.)

Michael David Proctor, Industrial Engineering
Merritt Island, Florida
Dissertation: The Analytical Effectiveness of Multiattribute Selection Models for MANTECH Projects. (Under the direction of John R. Canada and Peter J. O'Grady.)

Ruth Keeno Relos, Psychology
Raleigh, North Carolina
Dissertation: A Path Analytic Model of Turnover of Volunteers in Human Service Organizations. (Under the direction of Donald A. Drewes.)

Luz Marina Reyes, Horticultural Science
Bogota, Colombia
Dissertation: Isozyme Analysis of *Ipomoea trifida*, a Species Closely Related to *Ipomoea batatas* (L.) Lam. (Under the direction of Wanda W. Collins.)

Tony Adel Rizk, Mechanical Engineering
Kawkaba, Lebanon
Dissertation: Groundwater Flow and Contaminant Transport in Geologic Media. (Under the direction of Clement Kleinstreuer.)

Mary Clare Robbins, Mechanical Engineering
Raleigh, North Carolina
Dissertation: Drying in Capillary-porous Media. (Under the direction of M. Necati Özisik and D. Scott McRae.)

Eleanor Joyce Simmons Roland, Psychology
Chapel Hill, North Carolina
Dissertation: Early Childbearing, Family Life Cycle Events and Later Economic Self-sufficiency (An Exploration of Transitions to Adulthood among African-American Women). (Under the direction of Donald W. Drewes.)

Dennis Angeles Romero, Microbiology
St. Paul, Minnesota
Dissertation: Lactococcal Insertion Sequence IS946: Isolation, Characterization and Development as an Experimental Tool. (Under the direction of Todd R. Klaenhammer.)

Shanghsien Rou, Materials Science and Engineering
Tainan, Taiwan, Republic of China
Dissertation: Characterization of Perovskite Thin Films. (Under the direction of Angus I. Kingon.)

Gordon Michael Shedd, Materials Science and Engineering
Petersburg, Pennsylvania
Dissertation: Scanning Tunneling Microscopy Studies of Clusters and Materials Modification at the Nanometer Scale. (Under the direction of Phillip E. Russell.)

Shangnan Shui, Economics
Beijing, People's Republic of China
Dissertation: Impacts on the U. S. Cotton Industry of Removing the Multifiber Arrangement. (Under the direction of John C. Beghin and Michael K. Wohlgenant.)

Shridhar Bhalchandra Shukla, Computer Engineering
Monterey, California
Dissertation: On Parallel Processing for Real-time Artificial Vision. (Under the direction of Dharma P. Agrawal.)

Chaur-Ming Shyu, Nuclear Engineering
Taichung, Taiwan, Republic of China
Dissertation: Development of the Monte Carlo - Library Least-squares Method of Analysis for Neutron Capture Prompt Gamma-ray Analyzers. (Under the direction of Robin P. Gardner and Kuruvilla Verghese.)

Yongkun Sin, Electrical Engineering
Inchon, Korea
Dissertation: Strained-layer InGaAs-GaAs-AlGaAs Quantum Well Lasers and Transverse Junction Stripe Lasers. (Under the direction of Robert M. Kolbas.)

Brent Steven Sipes, Plant Pathology
Bolingbrook, Illinois
Dissertation: Fertility and Viability of Parasitic Biotypes of *Heterodera glycines*. (Under the direction of Kenneth R. Barker.)

Lois Lundie Spence, Science Education
Raleigh, North Carolina
Dissertation: Factors That Characterize Teachers Who Plan and Take Field Trips. (Under the direction of Jack H. Wheatley.)

Ladda Tangbanluekal, Toxicology
Bangkok, Thailand
Dissertation: Stimulation and Inhibition of Prostatic Inflammation and Fibromuscular Growth. (Under the direction of Peter J. Bentley and C. Lee Robinette.)

Barbara Ann Terry, Zoology
Townsville, North Carolina
Dissertation: A Forty-eight Hour Light Microscopy Study of *in vitro* Eosinophil Attack on Schistosomula of *Schistosoma Mansoni*. (Under the direction of William C. Grant and John F. Roberts.)

Dan Eric Westberg, Crop Science
Fayetteville, Arkansas
Dissertation: Effect of Acifluorfen on Chlorimuron Phytotoxicity to Common Cocklebur (*Xanthium strumarium*) and Sicklepod (*Cassia Obtusifolia*). (Under the direction of Harold D. Coble.)

Maddumage Gamini Wickramasekara, Electrical Engineering
Avissawella, Sri Lanka
Dissertation: Harmonic Characterization of Power Distribution Systems: A Hybrid Approach. (Under the direction of John J. Grainger.)

Carlton Maddrey Wilson, Industrial Engineering
Clemson, South Carolina
Dissertation: Analysis and Control of Large AGV Systems. (Under the direction of Thom J. Hodgson and Russell E. King.)

Michael Edward Wisniewski, Statistics
Cary, North Carolina
Dissertation: Analysis of Time Series with Missing Values. (Under the direction of Bibhuti B. Bhattacharyya.)

Thomas Keith Wood, Chemical Engineering
Greensboro, North Carolina
Dissertation: Analysis of Cloned-gene Expression in *E. coli*. (Under the direction of Steven W. Peretti and David F. Ollis.)

Michael Jacob Yablonski, Biochemistry
Scranton, Pennsylvania
Dissertation: A Study of the Role of the Ferritin Protein Coat in the Process of Iron Core Formation. (Under the direction of Elizabeth C. Theil.)

Binghuei Barry Yang, Food Science
Taipei, Taiwan, Republic of China
Dissertation: Particle Residence Time Distribution Studies of Two-phase Flow in Non-heated Straight Circular Conduit. (Under the direction of Kenneth R. Swartzel.)

Woo Suk Yang, Electrical Engineering
Seoul, Korea
Dissertation: Motion Estimation of 3D Objects Using Multi-sensor Data Fusion. (Under the direction of Ren C. Luo.)

UNDERGRADUATE DEGREES

Degrees Conferred

JUNE 26, 1990

AUGUST 7, 1990

DECEMBER 19, 1990

College of Agriculture and Life Sciences

BACHELOR OF SCIENCE IN BIOLOGICAL AND AGRICULTURAL ENGINEERING

Jointly administered by the College of Agriculture and Life Sciences and the College of Engineering.

Degrees Conferred December 19, 1990

Linda Faye Leigh ..... Creswell
**Issac Bryan Singletary ..... Bladenboro

BACHELOR OF SCIENCE IN CONSERVATION

Jointly administered by the College of Agriculture and Life Sciences and the College of Forest Resources.

Degrees Conferred December 19, 1990

Robert John Hallbauer ..... Fayetteville
**John Paul Williams ..... Ramseur

BACHELOR OF SCIENCE IN AGRICULTURAL BUSINESS MANAGEMENT

Degree Conferred June 26, 1990

Bennett Allen Wilder ..... Raleigh

Degree Conferred August 7, 1990

Samuel Locksley Hall ..... Yadkinville

Degrees Conferred December 19, 1990

*Larry David Edwards, Jr. ..... Mooresville
Erich Wayne Gumto ..... Renfrew, PA
Christopher Marvin Hedrick ..... Franklinton
Ted James Hyde II ..... Belmont
†Brent Jerald McClendon ..... Raleigh
William Randolph Temple ..... Brodnax, VA
Amy Lou Westmoreland ..... Kernersville

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF SCIENCE IN AGRICULTURAL ECONOMICS

Degree Conferred December 19, 1990

Virginia Walton Smith ..... Robersonville

BACHELOR OF SCIENCE IN AGRONOMY

Degrees Conferred December 19, 1990

Mervin Arnold Frantz III ..... Chapel Hill
Kevin Neal Hughes ..... Ash
Stephen Brant Marshall ..... Hampstead
Bryan Mitchell Moore ..... China Grove
Jeffrey Stephenson Parks ..... Goldsboro

BACHELOR OF SCIENCE IN ANIMAL SCIENCE

Degrees Conferred June 27, 1990

†Louis Duncan Beretich ..... Clinton
Mayford Dennis Sells, Jr. ..... Kinston
†Wendy Michelle Thompson ..... Pelham

Degrees Conferred August 7, 1990

Elizabeth Ann Brinegar ..... N. Wilkesboro
Claxton Forest Stallings, Jr. ..... Belvidere

Degrees Conferred December 19, 1990

Christopher David Canipe ..... Shelby
John Eric Ellis ..... Old Fort
Jennifer Beth Goode ..... Lincolnton
†Wendy Carol Horton ..... Kinghtdale
Michael Wesley Huff ..... Oxford
Sushila Jane Kapil ..... Raleigh
Mark Brandon McComas ..... Cary
William Bryant Morton ..... Apex
Scott Leon Munger ..... Cary
Jennifer Lynn Perruquet ..... Monroe
†Patricia Ann Routh ..... Randleman
Michael Craig Siegel ..... Jamestown
Melanie Randolph Smith ..... Tucson, AZ
Roland Lynn Walters ..... Efland
H**Cynthia Leigh Warner ..... Raleigh

BACHELOR OF SCIENCE IN APPLIED SOCIOLOGY

Degree Conferred August 7, 1990

Nancy Anne Nalven ..... Great Neck, NY

Degrees Conferred December 19, 1990

Angela Dale Pruitt ..... Wilson
Randall White Walston ..... Roxobel

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF SCIENCE IN BIOCHEMISTRY

Degrees Conferred June 26, 1990

Jan Alice Anderson ..... Raleigh
***John Alan Diehl ..... Raleigh
Ray Scott Higdon ..... Charlotte
†Philip Ansel McClellan ..... Shelby
Shawn Michael Weiss ..... York, PA

Degree Conferred August 7, 1990

Lisa Lee Hefner ..... Mount Mourne

Degrees Conferred December 19, 1990

†*Stephen Donald Benjamin ..... Charlestown, IN
†Paul Marshall Duncan ..... Richmond, VA
H†*Michael Joseph Goodheart ..... Raleigh
†Bryan Wayne Kluttz ..... Kannapolis
H†***Alice Lynn Lewis ..... Raleigh
*Jennifer Lynn McLain ..... Raleigh
Sang Woon Myung ..... Greensboro
H†**Harlan Luke South ..... Richmond, VA
Denise Darlene Stalvey ..... Wilmington
Theresa Helen Sullivan ..... Jacksonville
Danny Marcellus Wright ..... Henderson

BACHELOR OF SCIENCE IN BIOLOGICAL AND AGRICULTURAL ENGINEERING TECHNOLOGY

Degree Conferred August 7, 1990

*Robert Scott Clontz ..... Troutman

Degrees Conferred December 19, 1990

Donald Ray Pearson, Jr. ..... Raleigh
Stanley Keith Robinson ..... Rocky Mount
Donald Louis Wells ..... Henderson

BACHELOR OF SCIENCE IN BIOLOGICAL SCIENCES

Degrees Conferred June 26, 1990

Carol Paska Dougherty ..... Dania, FL
Lee Sawyer Friedmann ..... Jacksonville, FL
**Douglas Eric Norris ..... Apex
William Hartwell Wilkinson, Jr. ..... Valdese
Wesley Waugh Wilson ..... Lenoir

Degrees Conferred August 7, 1990

***Betty Harmon Hamilton ..... Fayetteville
Sharon Christine Maloid ..... Lovettsville, VA
*Victoria Jean Saia ..... W. Babylon, NY
Mary Penny Thompson ..... Fayetteville

Degrees Conferred December 19, 1990

Susan Elizabeth Anderson ..... Chapel Hill
H***Elena Maria Cano ..... Madrid, Spain
Brian Keith Cassel ..... Raleigh

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Jennifer Alice Goodwin ..... Plymouth
*Richard Yates Hayes ..... Raleigh
Karyn Sue James ..... Mebane
Sandra Kay Jerrim ..... Raleigh
H*Denise Finneran Jones ..... Palm Bay, FL
*Minh Van Lam ..... Cho Lon, Vietnam
H†***Alice Lynn Lewis ..... Raleigh
Judith Lynn Lewis ..... Raleigh
Erin Susan McGuckin ..... Wilmington
Kerry Lynn Miller ..... Hickory
Katherine Michelle Poole ..... Cincinnati, OH
Milessa Adair Poole ..... Raleigh
†Patricia Ann Routh ..... Randleman
*Mark Leonard Stamper ..... Charlotte
*Woosung Yun ..... Seoul, Korea

BACHELOR OF SCIENCE IN BIOLOGICAL SCIENCES (Microbiology)

Degrees Conferred June 26, 1990

Sharon Renee Collins ..... East Bend
***Joan Marie Skroch ..... Raleigh

Degrees Conferred August 7, 1990

***Patricia Gardner Clapp ..... Raleigh
Jun Manuel Versola ..... Raleigh

Degrees Conferred December 19, 1990

***Lisa Ann Caira ..... Cary
Eric Michael Hess ..... Timberlake
†*Sharon Elizabeth Pope ..... Garner

BACHELOR OF SCIENCE IN BOTANY

Degrees Conferred June 26, 1990

Jeffrey Scott Coffey ..... Wilson
Richard Allen Frazelle ..... Wilmington

Degree Conferred August 7, 1990

*Mary Beth Pellettieri ..... Downer Grove, IL

BACHELOR OF SCIENCE IN FISHERIES AND WILDLIFE SCIENCES

Degrees Conferred August 7, 1990

Earl Clarence Bassett IV ..... Edenton
Michael Eric McRoy ..... Washington

Degrees Conferred December 19, 1990

Bradley Steven Burgess ..... Denver
Janis Kay Heller ..... Reidsville
Frederick Ray Hubbard ..... Garner
Mark Ellis Johns ..... Raleigh
***Kent Shellie Karriker ..... Charlotte
Jason Charles Peoples ..... Roanoke Rapids
John Turner Saunders III ..... Asheville
Catherine Shershanovich ..... Elmwood Park, NJ

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF SCIENCE IN FOOD SCIENCE

Degree Conferred August 7, 1990

†**Jaime Mullerat ..... Barcelona, Spain

Degrees Conferred December 19, 1990

Martha Anne McLean ..... Laurinburg
Debra Diane Smith ..... Clearwater, FL

BACHELOR OF SCIENCE IN HORTICULTURAL SCIENCE

Degree Conferred August 7, 1990

*David Alan Crouse ..... Winston-Salem

Degrees Conferred December 19, 1990

Kenneth Franklin Brooks ..... Cary
Ronald Sellers Dalton ..... Lake Lure
Stephen Andrew Ford ..... Matthews
Carol Gordner Jenkins ..... Cary
Karen Leigh Judson ..... Rockville, MD
***Donald Frank Kelsey ..... Greensboro
William Herbert Lewis III ..... Madison
Lou Alexandrea Maxwell ..... Seven Springs
Melissa Gale Roberts ..... Willow Springs
Michael Todd Rodgers ..... Cary
*Laurie Jo Smith ..... Kitty Hawk

BACHELOR OF SCIENCE IN INDIVIDUALIZED STUDY PROGRAM

Degree Conferred December 19, 1990

†Marjorie Johnice Smith ..... Durham

BACHELOR OF SCIENCE IN MEDICAL TECHNOLOGY

Degrees Conferred August 7, 1990

Mitra Zakeriniasar Dabestani ..... Cary
Ruth Matilda Reid ..... Winston-Salem

BACHELOR OF SCIENCE IN POULTRY SCIENCE

Degrees Conferred June 26, 1990

†Louis Duncan Beretich ..... Clinton
†Wendy Michelle Thompson ..... Pelham

Degree Conferred August 7, 1990

†**Jaime Mullerat ..... Barcelona, Spain

Degrees Conferred December 19, 1990

†Wendy Carol Horton ..... Knightdale
Aaron Devone Sheffield ..... Magnolia
Kristal Price Velazquez ..... Raleigh

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF SCIENCE IN ZOOLOGY

Degrees Conferred June 26, 1990

Noel Adolph Paul III ..... New Bern
Julia Elizabeth Rogers ..... Charlotte
Joseph Royden Saah ..... Garner
Angela Marie Sorie ..... Roanoke Rapids

Degrees Conferred August 7, 1990

Jennifer Wiggs Ballance ..... Goldsboro
Montese Renee Davis ..... Lumberton
H†*Darlene Brown Medford ..... Waynesville
Regina Oakley Phillips ..... Greensboro
Tracey Kathlyn Ritzman ..... Akron, OH
Marcia Lynn Ruland ..... Collierville, TN
Kori Ann Wolfe ..... Fletcher
Michael Paul York ..... Advance

Degrees Conferred December 19, 1990

H*Amer Adam ..... Cary
Tenesha Arlethia Bazemore ..... Chesapeake, VA
H**Jennifer Caldwell Brown ..... Goldsboro
Cinnamon Dawn Cureton Frame ..... Raleigh
Todd Cameron Franklin ..... Morganton
H**Jack Miller Freeman, Jr. ..... Ellenboro
Kyle Royce Harper ..... Goldsboro
Patrick Everette Kavanaugh ..... Greenville
William Regis Krisulewicz ..... Raleigh
Kelly Jean Maguire ..... Windsor, NJ
Michael Nicholas Mantzouris ..... Silver Spring, MD
†Corina Michelle McFarland ..... Albemarle
***Stephen Lee Perkins ..... Lillington
Valorie Antionette Pigotte ..... Supply
*Jennifer Harrington Raynor ..... Greensboro
Pamela Ellen Rogers ..... Matthews
†Patricia Ann Routh ..... Randleman
Christopher Allen Rowe ..... Wilmington
Jenny Lynn Smith ..... Winston-Salem
Melinda Anne Smith ..... Forest City
Diane Lynn Stenson ..... Hendersonville
John Daniel Stuckey II ..... Gibsonville
H*Stephen Gregory Truesdale ..... New Bern
Debra Bright Webb ..... Swan Quarter
Lynda Gidney Williamson ..... Shelby
Chong Young Yu ..... Fayetteville

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

School of Design

BACHELOR OF ENVIRONMENTAL DESIGN

Degree Conferred December 19, 1990

*Caroline Courtney Jones ..... Charlotte

BACHELOR OF ENVIRONMENTAL DESIGN IN ARCHITECTURE

Degrees Conferred August 7, 1990

Glenn Alan Knapp ..... Raleigh
Mary Kimberly Munns ..... Raleigh
*Thomas Wright O'Brien ..... Durham

Degrees Conferred December 19, 1990

*Clinton Keith Compton ..... Raleigh
Michael Lee Rosenthal ..... Denville, NJ
*David Christopher Sledge ..... Norlina
Todd Douglas Thames ..... Dunwoody, GA

BACHELOR OF ENVIRONMENTAL DESIGN IN PRODUCT DESIGN

Degrees Conferred August 7, 1990

Daniel Clayton Schwab ..... Raleigh
*Jason Johnson Stanford ..... Haiku, HI

Degrees Conferred December 19, 1990

*David Newell Banko ..... Raleigh
David Alan Barnette ..... Morganton
Bruce Anthony Browning ..... Durham
*Aaron Roger Cox ..... Greensboro
Craig David Hathaway ..... Mooresville
Jaime Lozano ..... Bakersfield, CA
Daniel Roach Metz ..... Raleigh
Julie Mignon Wilson ..... Wilmington

BACHELOR OF ENVIRONMENTAL DESIGN IN VISUAL DESIGN

Degree Conferred August 7, 1990

Darryl Ketcham ..... Bergenfield, NJ

Degrees Conferred December 19, 1990

*Jay Cary Liner ..... Waynesville
Sean Mark Overington ..... Jacksonville
***Shannon David Treaster ..... Shelby
Linda Kaye Williams ..... Raleigh

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

College of Education and Psychology

BACHELOR OF ARTS IN PSYCHOLOGY

Degrees Conferred June 26, 1990

**Patricia Swartz Bradshaw ..... Indiana, PA
***Katherine Joyce Follett ..... Cary
Maria Bernadette Munford ..... New Bern
James Mark O'Dekirk ..... Cary
**Valerie Irene Troth ..... Raleigh

Degrees Conferred August 7, 1990

***Kenneth Dean Brady, Jr. ..... Raleigh
Shawn Edward Crutchfield ..... Raleigh
Christopher Hampton Johnson ..... Fayetteville
John Christopher Midgley ..... Germantown, MD
Rebecca Lynn Sunderman ..... Aliquippa, PA

Degrees Conferred December 19, 1990

Timothy Barham ..... Wilson
Cynthia Elsa Barrett ..... Wilkesboro
Edward John Eder, Jr. ..... Rockville, MD
Paula Renee Gatlin ..... Pickens, SC
**Lawrence Russell Glickman ..... Holliston, MA
Scott Alan Goodwin ..... Kinston
**Julie Renaud Henegar ..... Raleigh
Devin Land Hight ..... Newton
Didrik Wendell Hoag ..... Freehold, NJ
Lisa Suzanne Huddle ..... Salisbury
*Patrice Jeraldine Jones ..... Raleigh
**Christopher Bing Kinlaw ..... New Bern
Gwenda Lynne Lynch ..... Raleigh
***Sharron Jackson Overton ..... Garner
Cheryl Lynn Perry ..... Kinston
Arlene Lois Peters ..... Bulawayo, Zimbabwe
*Linda Ann Ruebesam ..... Raleigh
*Teresa Bennett Stephens ..... Raleigh
Robert William Stimart ..... Charlotte
***Carol Fortier Sullivan ..... Raleigh

BACHELOR OF SCIENCE IN EDUCATION

Agricultural Education

Degree Conferred August 7, 1990

Wilma Arleca Chapman Harris ..... Lake Toxaway

Degrees Conferred December 19, 1990

Arnold Greg Anderson ..... Old Fort
Johnny Douglas Weaver, Jr. ..... Kenly

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

General Studies

Degrees Conferred August 7, 1990

Danielle Leigh Hassler ..... Hamlet
John Anthony Pastore ..... Madison

Degrees Conferred December 19, 1990

Theresa Mastrianni Bennett ..... Concord
**Angela Marie McBride Flenniken ..... Raleigh
Tina Elaine Goodman ..... Jacksonville
Brett Carlton Tetter ..... Salisbury

Health Occupations Teacher Education

Degree Conferred August 7, 1990

***Janet Nordman Hutchins ..... Raleigh

Degrees Conferred December 19, 1990

**Lisa Marie Campbell ..... Raleigh
**Nancy Allen St. Onge ..... Raleigh
***Angela Gilliam Stephenson ..... Angier

Industrial Arts Education

Degree Conferred December 19, 1990

John Anderson Stratton ..... Charlotte

Mathematics Education

Degrees Conferred December 19, 1990

Alberita Vanessa Guess ..... Marion, SC
*Anthony Boyd Hargrove ..... Bladenboro
**Anne Elizabeth Stubbins ..... Mooresville
***Pamela Jane Vehling ..... St. Paul, MN
Melena Lynn Weinhold ..... Salisbury

Mathematics Education, Middle Grades Concentration

Degrees Conferred December 19, 1990

Wanda Lynn Ange ..... Washington
Sondra Lynne Dail ..... Cary
Alicia Ann Wall ..... Durham

Middle Grades, Language Arts and Social Studies Concentration

Degree Conferred December 19, 1990

*Patricia Perry Dobson ..... Henderson
*Constance Ann Graham ..... Delray Beach, FL
**Karen Liverman Hobday ..... Raleigh
Kathryn Alison King ..... Cary
***Cathy Tilley Morgan ..... Fuquay-Varina
*Linda Tyson Sloop ..... Lillington
***Cynthia Lynn Smith ..... Raleigh
Amy Hinson Stanley ..... Smithfield

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Middle Grades, Mathematics and Science Concentration

Degrees Conferred December 19, 1990

Kimberle Anne Browne ..... South Boston, VA
*Claire Jeannette Crisp Chadwick ..... Apex
Cynthia Quay Huggins ..... Fort Worth, TX

Science Education

Degrees Conferred December 19, 1990

***Claire Joan Block ..... Apex
**Julie Ann Davis ..... Biscoe
Kristen Yvette Hall ..... Gates
†*Lora Ann Long ..... Apex
Tonya Ellen Poplin ..... Albemarle
†*Kelly Lynn Prelipp ..... Charlotte
Stephen Eric Slaughter ..... Maiden
Charlotte Talley Soto ..... Willow Springs

Technical Education

Degree Conferred December 19, 1990

*Walter Dale Rotenberry ..... Dobson

College of Engineering

BACHELOR OF SCIENCE IN TEXTILE ENGINEERING

Jointly administered by the College of Textiles and the College of Engineering.

Degrees Conferred December 19, 1990

Joseph Kevin Airington ..... Clayton
Michael Loyd Maynard ..... Apex
Melisa Michele Ringer ..... New Freedom, PA

BACHELOR OF SCIENCE IN AEROSPACE ENGINEERING

Degree Conferred June 26, 1990

Juan Pablo Acevedo ..... Bucaramanga, Colombia

Degree Conferred August 7, 1990

Dat Duong Giap ..... Raleigh

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Degrees Conferred December 19, 1990

John William Brennan, Jr. ..... Springfield, VA
**Stephen Price Cook ..... Raleigh
Carl Wesley Kirby ..... Southport
Notra Jean Lail ..... Hickory
Gary Tao ..... Raleigh

BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING

Degrees Conferred June 26, 1990

**Janine Carlan Burleson ..... Charlotte
***Jeffrey Ralph Kelby ..... Cary
Ray Louise Umstead ..... Durham

Degree Conferred August 7, 1990

Anna Revonda Porch ..... Gastonia

Degrees Conferred December 19, 1990

Ashraf Zuhair Bedwan ..... Charlotte
Sharon Ruth Bokeny ..... Raleigh
Jonanne Costa Brailsford ..... Ellington, CT
Kathryne Alicia Brewington ..... Greensboro
Adrienne Nannette Brown ..... Kings Mountain
William Earl Cobb ..... Reidsville
David George Crowther ..... Raleigh
**Robert Shean Cumbee ..... Supply
Tina Marie Gaddy ..... Wadesboro
Sarah Elizabeth Gay ..... Wilmington
Kevin Jerome Gramelspacher ..... Tell City, IN
*Angela Dawn Jarrett ..... Newton
†Bernardo A Jurado-Blanco ..... Maracay, Venezuela
**Mitchell Alan Malcolm ..... Centerville, GA
Jack Carlton Martin ..... Monroe
†Melinda Joyce McDaniel ..... Warner Robins, GA
**John Gerhard Michael ..... Warner Robins, GA
Andrea Leigh Nelson ..... Macon, GA
Robert Bora Nevruz ..... Lawrenceville, NJ
***Paul Ray Peters ..... Gibsonville
Darryl Wayne Rogers ..... Pilot Mountain
†Gregory Tyrone Worsley ..... Raleigh

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

Degrees Conferred June 26, 1990

Gregory Paul Dover ..... Shelby
Louis Todd Dudley ..... Raleigh
Timothy Alan Jewett ..... Winston-Salem
Blb Alan May ..... Spring Hope
Gregory William Morrison ..... Charlotte
**Benjamin Byron Thomas ..... Cary

Degrees Conferred August 7, 1990

Timothy Mark Arey ..... New London
Gardner Dulaney Jones II ..... Raleigh
Phillip Ashley Morrison ..... Midland
Curtis Wayne Thornton ..... Cary

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Degrees Conferred December 19, 1990

***John Edmund Anderson ..... Roanoke, VA
James Mitchell Baise ..... Winston-Salem
Carl Andrew Barclay ..... Cary
*Kenneth Warren Bright ..... Sanford
Joelle Bryan ..... Havelock
**Scott Douglas Bryant ..... Raleigh
Mark Emmet Cooney ..... Cary
Shanda Harrelson Davenport ..... Manteo
Mary Alice Dickens ..... Rocky Mount
*James Michael Forehand ..... Goldsboro
William Cabell Garbee II ..... Lynchburg, VA
John Thomas Grimes ..... Silver City
*Alysia Gale Hedrick ..... Concord
John Thayer Jenkins II ..... Greenville
Roger Craig Kluckman ..... Fayetteville
Michael Phil Lewis ..... Pilot
**Rene Louise Martin ..... Cary
***Jeffrey Charles Moeller ..... Raleigh
Daniel Preston Moses ..... Charlotte
Gordon Shaw Myers ..... Raleigh
Jeffrey Scott Nelson ..... Fayetteville
Kit Allen Persiani ..... Jacksonville
Eric James Randall ..... Herndon, VA
*Pieter Karl Scheer ..... Misenheimer
Richard Lee Van Tassel II ..... Pittsburgh, PA
Robert Anthony Vause ..... Selma
*Kevin William Vogel ..... Charlotte
James Kent Walker ..... Davidson
Lonnie Roland Watkins ..... Brevard
**James Brent Wescott ..... High Point
*Yvette Caroline White ..... Silver Spring, MD
William Arthur Williams II ..... Wilmington
Kenneth Brian Wrenn ..... Durham

BACHELOR OF SCIENCE IN CIVIL ENGINEERING—CONSTRUCTION OPTION

Degree Conferred June 26, 1990

Ronald Elton Davenport, Jr. ..... Kinston

Degree Conferred August 7, 1990

†Kipp Wilson Cheek ..... Charlotte

Degrees Conferred December 19, 1990

Scott Thomas Ajax ..... Cary
Terri-Lynne Banner ..... Huntersville
Randall Arthur Boyd ..... Cary
Scott Gardner Capps ..... Oxford
William Kevin Davie ..... Greensboro
Vernon Tucker Hackett ..... Laurinburg
Bryan Kent Jackson ..... Four Oaks
*Dennis Wayne Jernigan ..... Benson
Derrick Wayne Lewis ..... Middlesex
Andy Charles Lovingood ..... Concord
William Craighhead McGwier ..... Charlotte
Mark Laster Ogburn ..... Sanford
Jonathan McCalvin Overton ..... Henderson
Michael Wayne Stewart ..... Conover

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF SCIENCE IN COMPUTER ENGINEERING

Degrees Conferred June 26, 1990

†***James Doyle Boggs, Jr. ..... Westminster, MD
Danny Adam Roach ..... Lexington

Degrees Conferred August 7, 1990

**Vikas Chandra ..... Raleigh
Darryl Lawrence Hafermalz ..... Charlotte
†*David Bevel Nelson ..... Lexington

Degrees Conferred December 19, 1990

†John Colin Bass ..... Greensboro
†Christopher Patrick Berlien ..... Salisbury
Robert Douglas Edmondson ..... Creston
†Robert Earle Finley ..... Salisbury
**Samuel Anderson Garwood, Jr. ..... Lexington
Ryan Douglas Gatling ..... Pocomoke, MD
Karen Ysteboe Lanning ..... Burlington
Franco Stefano Venturi ..... Raleigh
†***Kam Fu Yee ..... Raleigh
†Eric Robert Zothner ..... Cary

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

Degrees Conferred June 26, 1990

Charles Henry Conrad ..... Hatboro, PA
George Bland Miler ..... Greenville, SC

Degrees Conferred August 7, 1990

Ivy Lynn Gates ..... Garland, TX
Gregory Scott Hester ..... Durham
William Patrick Howlett ..... St. Petersburg, FL
Simone Dianna Kellum ..... Piscataway, NJ
Bruce Todd Kluckman ..... Fayetteville
John Gerhard Matthews ..... Greensboro
Michael Keith Newnam ..... Elon College
Rhonda Aleathea Stanton ..... Long Branch, NJ
Connie Nannette Strickland ..... Wendell
Kenneth James Targosky ..... Cary
Scott Dennis Totaro ..... Charlotte
Robert Walter Trojak ..... Mount Holly, NJ

Degrees Conferred December 19, 1990

David Holden Bank ..... South Boston, VA
Howard Arnie Barr ..... Wake Forest
*Derek Wayne Blalock ..... Charlotte
Brian Patrick Bledsoe ..... Winston-Salem
***Janet Anne Brewer ..... Chapel Hill
**William Scott Burney ..... White Oak
Lynn Mueller Canaday ..... Raleigh
***Carla Janine Combs ..... Granite Falls
Tracey Marietta Covington ..... Rockingham
Todd Michael Dalness ..... Fayetteville
Andrew Joseph Foglia ..... Raleigh
Robert Wendell Green ..... Raleigh
William Thomas Hansley ..... Raleigh
*James Douglas Harwood ..... Albemarle

† Co-major * Cum Laude ** Magna Cum Laude *** Summa Cum Laude H Honors Program

James Alexander Herring III ..... Thomasville
Karen Pennell Holman ..... Lenoir
Selene Waynetta Hudson ..... Lumberton
†Daniel Everett James ..... Burlington
Nicholas Dimitriou Koutsoupias ..... Naoussa, Greece
***Laura Anne Lehman ..... Cary
Larnell Lennon ..... Whiteville
Thomas Paul Lipps ..... Raleigh
Dennis Meek ..... Ithaca, NY
†John Christian Mohr ..... Raleigh
Christopher Lee Page ..... Tarboro
Joanne Waddell Paquette ..... Raleigh
Kenneth Edward Parker ..... Goldsboro
Guido Phillip Pfuhl ..... Charlotte
**Mark Donald Priest ..... Cape Girardeau, MO
Kent Scott Robinson ..... Putnam, NY
Michelle Reneé Robinson ..... Conover
*Sami Fuad Shaban ..... Damascus, Syria
Martin Louis Simpson, Jr. ..... Vass
**Lori Christine Sullivan ..... Charlotte
Donald Morris Sutter ..... Raleigh
*Vernon Dale Thomas, Jr. ..... Aberdeen
***Sonja Hougom Tilley ..... Hillsborough
*Cam Le Tran ..... Winston-Salem
Pamela Leigh Vereb ..... Garner
James Lee Ward ..... Wilmington
*Melissa Kay White ..... Mocksville

BACHELOR OF SCIENCE IN CONSTRUCTION MANAGEMENT

Degree Conferred August 7, 1990

†Kipp Wilson Cheek ..... Charlotte

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

Degrees Conferred June 26, 1990

***Dennis Ray Blankenship ..... Barboursville, WV
†***James Doyle Boggs, Jr. ..... Westminster, MD
Monica Beck Caputo ..... Raleigh
Donna Marie Garnett ..... Raleigh
David North Jackson ..... Fayetteville
Richard Bradley Kennedy ..... Greensboro
Karl Dean Parks ..... Winterville
Dipak Manilal Patel ..... Greensboro
Davor Antonio Pavisic ..... Cochabamba, Columbia
Phillip Andrew Smith ..... Grifton
Samuel David Swaringen ..... Albemarle
Victor Van Wallace ..... Greensboro
Joseph Michael Wooten ..... Wilson

Degrees Conferred August 7, 1990

***Doyle Bryan Allen ..... Lynchburg, VA
*John Patrick Anderson ..... Hot Springs
Victor Bass II ..... Garner
Ronnie Scott Fincher ..... Sanford
Sean Madison Fokes ..... Fayetteville
Trevor Gadson ..... Georgetown, SC
Michael Frederick Gaston ..... Raleigh

† Co-major * Cum Laude ** Magna Cum Laude *** Summa Cum Laude H Honors Program

Bradley Martin Happel ..... Winston-Salem
Claude Michael Hargrove ..... Fayetteville
Charlie Perry Hilliard ..... Raleigh
Subir Kumar ..... Jamshedpur, India
***Tina May Lee ..... Hickory
John Gorham Low ..... Wilmington, DE
†*David Bevel Nelson ..... Lexington
James Frederic Ruby ..... Wilson
**Rodney Ray Rymer ..... China Grove
Scott Richard Stumpf ..... Raleigh
*Jeffrey Mark Winterich ..... Lynchburg, VA

Degrees Conferred December 19, 1990

Jeffrey Allen Achauer ..... Raleigh
*George Martin Anderson, Jr. ..... Asheville
Omar Said Barakat ..... Qalgilia West Bank Israel
Jeffrey Andrew Barlow ..... Kinston
†John Colin Bass ..... Greensboro
†Christopher Patrick Berlien ..... Salisbury
Ramesh Bhatia ..... Raleigh
George Julian Bitar ..... Raleigh
Tabula Tonnette Bost ..... Greensboro
Leslie Howard Boyd II ..... Bahama
Michael Allen Brotherton ..... Sherrills Ford
Tri Quoc Bui ..... Charlotte
Timothy Milton Causey ..... Davidson
Michael Ng Chua ..... Raleigh
Binh Diep Chung ..... Raleigh
†*John Christopher Cleary ..... Hendersonville
Brian Keith Dalen ..... Freen Cove Spring, FL
Inga Marquerite Davis ..... Tarboro
*John Fred Davis ..... Wilkesboro
William Andrew Davis ..... Winston-Salem
**Steven Brian Day ..... Andrews
William Robert Dees ..... Raleigh
Kevin Eric Dow ..... Houston, TX
Gregory Alan Driver ..... Wendell
Hany Abdul-Hafez Elkordy ..... Cairo, Egypt
**Christine Cutrell Ferguson ..... Belhaven
†Robert Earle Finley ..... Salisbury
Joseph Lynn Flowers ..... Wilson
Stephen Kight Forbes ..... Roanoke Rapids
Susan Carol Gentry ..... Candler
William Joseph Grass ..... Asheville
Michael Joseph Hare ..... Asheville
Scott Brian Harris ..... Burlington
Dennis Arnold Haynes ..... Fayetteville
*Andrew James Hooks ..... Henderson, NV
*Robert Melton Howerton ..... Greensboro
***Dennis Hui ..... Rocky Mount
Tamala Renee Jamieson ..... Greensboro
***Blake Alden Johnson ..... Chattanooga, TN
Kim Johnson ..... Roxboro
†**Jeffrey Allen Joines ..... Winston-Salem
*Elaine Gloria Jonczak ..... Gastonia
Antonio Zachary Jones ..... Kinston

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Enessia Renee Jones ..... Littleton
Darrin Todd Joyce ..... Eden
Kendell Franklin Key ..... Mount Airy
***Michael Kokos ..... Mentor, OH
**Marina Stephani Kouyialis ..... Nicosia, Cyprus
*Nicos Mikis Kouyialis ..... Nicosia, Cyprus
*David Robert Kozischek ..... Jacksonville
Frank Anderson Lackey, Jr. ..... Statesville
Chong Yong Lee ..... Raleigh
Janet Leigh Lewis ..... Garner
*Debbie Lynn Liske ..... Raleigh
Michele Leigh Loesch ..... Charlotte
DeJim Christopher Lowe ..... Madison
Richard Gregg Lumsden, Jr. ..... Durham
Reena Indranath Madan ..... Cary
Kuhanandha Mahalingam ..... Raleigh
*Timothy Patrick Malone ..... Hickory
David Keith Mauney ..... Shelby
Steven Malcolm McCullen ..... Durham
Richard Lee McKibben ..... Fayetteville
**Mitzi Joy Misenheimer ..... Randleman
Veena Misra ..... Raleigh
Anna Marie Mitchell ..... Cary
†John Christian Mohr ..... Raleigh
Jeffrey Dale Morgan ..... Gold Hill
Thomas Daravann Outtarac ..... Hampton, VA
Jeffrey Daniel Padgett ..... Charlotte
Thomas William Powell, Jr. ..... Elizabeth City
Peggy Lynn Hill Rasmus ..... Raleigh
Philip Floyd Rasmus ..... Rapid City, SD
Sudhir Reddy ..... Hyderabad, Andhra
*Kara Jean Rempfer ..... Ernul
*Kimberly Carol Ross ..... Marshville
Thomas Edward Rozier ..... Lake View, SC
Richard Timothy Ruff ..... Eden
Kurt Dennis Rush ..... Gaithersburg, MD
Robert Lee Scoggins ..... Leland
Carey Bryan Sharpe ..... Linwood
David Nelson Sherk ..... Rocky Mount
Andrew Dale Sigmon ..... Davidson
*Larry Kevin Snead ..... Burlington
Linwood Michael Stroud ..... Greenville
Karen Ann Szypulski ..... Cary
Tong Meng Tang ..... Hendersonville
Charles Eric Temple ..... Fayetteville
Hemant Ambalal Thakkar ..... Rocky Mount
Melissa Marie Thrush ..... Fort Walton Beach, FL
Hung Ngoc Tran ..... Charlotte
*John Douglas Trask ..... Raleigh
Kenneth Christopher Treimann ..... Turnersville, NJ
Willis Pearce Weathers, Jr. ..... Burlington
Hope Irene Williams ..... Stokesdale
James Walker Williams, Jr. ..... Asheville
Eric Joseph Woerner ..... Dunn
Kenneth Lee Woollen ..... Charlotte
†***Kam Fu Yee ..... Raleigh
†Eric Robert Zothner ..... Cary

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF SCIENCE IN FURNITURE MANUFACTURING AND MANAGEMENT

Degrees Conferred June 26, 1990

Joan Wu Hwang ..... Taichung, Tiawan
Roscoe Wade Peele, Jr. ..... Apex

Degrees Conferred December 19, 1990

John Nathan Dowell ..... Newton
†Robert Judge Drew ..... Raleigh
James Robert Inscoe ..... Newton

BACHELOR OF SCIENCE IN INDUSTRIAL ENGINEERING

Degrees Conferred June 26, 1990

Dorene Leanne Chartier ..... Raleigh
Ken Marcus Clifton ..... Benson
Asaad Raef Fadel ..... Casablanca, Morocco
Hilton Murrell Howard ..... Jacksonville
David Dewitt Kalish ..... Charlotte
Kenneth Tipton Skillman ..... Wilmington
David Wendell Yates .....

Degrees Conferred August 7, 1990

Sheila Maureen Bennett ..... Raleigh
Ellen Birdsong Christy ..... Columbia, MD
***David Michael Dawson ..... Greensboro
Randall Keith Mizelle ..... Washington
Patrick Reid Morrah ..... Greensboro

Degrees Conferred December 19, 1989

Andrea LaCinda Ballard ..... Leland
Raymond Byron Ballard ..... Cary
Michele Tracy Battle ..... Greensboro
Darryl Leon Black ..... Fayetteville
Jeffrey Neil Britt ..... Rockford, IL
Howard Patrick Brown ..... Cary
Patty Wei-Pei Cheng ..... Durham
LaShane Danielle Crutchfield ..... Rockville, MD
†Robert Judge Drew ..... Raleigh
*Eric Ramon Guajardo ..... Durham
*William Thomas Hardy ..... Morehead City
Rhea Lorine Harris ..... Winston-Salem
*Ann Rothrock Hartman ..... Charlotte
**Mark Edward Hayes ..... Wilmington
Perrin Wattles Hunter ..... Sanford
Eric Charles Johnson ..... Raleigh
†**Jeffrey Allen Joines ..... Winston-Salem
Rodger Kirk Jones ..... Shelby
Jessica Anne Kelley ..... Cape Carteret
Janice Elizabeth Kleeman ..... Conklin, NY
Luke Edward Koerschner ..... Charlotte
James McClellan Langford ..... Ahoskie
Kellie Paige Leonard ..... Durham
**Kevin Dean Lowe ..... Stanley

Hye Rye Na Ma ..... Fayetteville
Ashley Carson Matthews ..... Wilmington
Benjamin Brian Matthews ..... Raleigh
Amy Lee Moran ..... Cary
Lou Ann Oakley ..... Rocky Mount
**Kenneth Alton Powell, Jr. ..... Valdese
Pamela Joy Powell ..... Cary
Sandra Denise Powell ..... Rocky Mount
Alfred Lewis Reid, Jr. ..... Gastonia
**Phillip Barden Renfrow ..... Kenly
Benjamin Dana Rhinehardt ..... Hickory
Christine Marie Sieredzki ..... Greensboro
David Weston Smith ..... Raleigh
Michael Ross Springston ..... Belpre, OH
Theresa Anita Thomas ..... Fayetteville
***Kimberly Ann Thompson ..... Raleigh
Brian David Vanover ..... Raleigh
*Arnt Georg von Ploetz ..... Salisbury
Lisa Wilmata Webber ..... Shelby
Cynthia Anne Wise ..... Rocky Mount

BACHELOR OF SCIENCE IN MATERIALS SCIENCE AND ENGINEERING

Degrees Conferred August 7, 1990

Robert John D'Amato ..... Moberly, MO
Robert Eugene Kestler, Jr. ..... Greensboro

Degrees Conferred December 19, 1990

Kerwin Neal Holden ..... Sylva
Derrick Kyle Julian ..... Salisbury
Pamela Kay Laws ..... Roxboro
***Kirk David Tackitt ..... Landenberg, PA

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

Degrees Conferred June 26, 1990

*Gregory Bruce Basden ..... Dudley
Mark Steven Curri ..... Utica, NY
*Dale Smith Davis ..... Thomasville
**Blake F. Deal III ..... Huntersville
Shahene Mark Neshat ..... Charlotte
Kevin Franklin Reason ..... Wilkesboro
Keith Lawrence Stanley ..... Shallote
Alfred John Trevillian, Jr. ..... Raleigh
*William Edward Wilkie II ..... Fletcher

Degrees Conferred August 7, 1990

***John Scot Gallimore ..... Davidson
Jonathan Lee Hatch ..... Four Oaks
Frederick Turner Hill III ..... Raleigh
Kenneth Todd Owens ..... Greensboro

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Clifton Charles Austin ..... Raleigh
Lance Alan Avery ..... Dunn
James Walter Beam, Jr. ..... Greensboro
*William David Beck III ..... Winton-Salem
John William Brotherton ..... Sherrills Ford
**Richard Carey Brown ..... Nashville, TN
Michael Aaron Buckner ..... Cullowhee
John Allen Burke II ..... Ligonier, PA
*Jesse James Burnette ..... Burlington
Rebecca Lee Carson ..... Leesville, SC
*Keith Dale Church ..... Lenoir
†*John Christopher Cleary ..... Hendersonville
Joe Donald Clevenger ..... Hillsborough
David Kevin Clontz ..... Shelby
***James Kenneth Comer, Jr. ..... Edenton
*Celia Dawn Cotton ..... Greensboro
Craig Ellis Crowther ..... Charlotte
Michael Thomas Dauterman ..... Mangilao, Guam
Richard Clifton Edmondson ..... Rocky Mount
Steven Howard Farlow ..... High Point
*Jeffrey Michael Fleck ..... Johnstown, PA
*Martin Robert Ford ..... Newportsville, PA
David August Frankena ..... Jamestown
Leonardo Sylvester Green ..... Raleigh
Alexander Grishin ..... Raleigh
Eisaku Shiokawa Groesbeck ..... Jacksonville
*Todd Anthony Grubb ..... Newark, OH
Mark Allen Hall ..... Greensboro
Thomas John Havelos ..... Charlotte
Eric Thomas Hice ..... Pleasant Garden
**Kirk Alexander Hoover ..... Lexington
Edwin Scott Houston ..... Forest City
Robert Earl Hughes ..... Weaverville
Harry Frederick Ingham II ..... Rochester, NY
***James Joseph Jetter ..... Holly Springs
*John Dee Kelley ..... Burlington
Gary Evans Kilpatrick ..... Statesville
John Young-Joon Kim ..... Greensboro
Rick Lee Kompelien ..... Roseau, MN
Jennifer Ann Kuchma ..... Longwood, FL
Mohammad Ali Malek ..... Raleigh
Frank Garrison Mangum ..... Sparta
Douglas Joseph Martoccia ..... Greenville
Guy Frank McCormick, Jr. ..... Fairmont
Bryan Anthony McKinney ..... Fletcher
James Franklin Miller, Jr. ..... Archdale
Jeffrey Ellis Miller ..... Terrell
Donald McCord Morse ..... Raleigh
Joseph Anthony Nardi ..... Raleigh
John Justice Page ..... Chapel Hill
***Anne Paige Parker ..... Four Oaks
*Kevin Scott Paschal ..... Winston-Salem

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Eric Jon Patow ..... Winston-Salem
Virginia Marie Prevatte ..... Aberdeen
Micheal Gregg Prince ..... Ellenboro
William Ross Pumphrey ..... Ashland, VA
Donald Eric Ramsey ..... Lincolnton
Daniel Houck Rebman ..... Raleigh
Christopher Micheal Robertson ..... Havelock
Montie Wayne Roland ..... Asheville
Edward Bagley Sanderford, Jr. ..... Raleigh
*Thomas Ronald Scattergood ..... Cary
**Michael Shane Sedell ..... Cary
Robert James Segelhorst ..... Davidsonville, MD
Thomas Michael Sember ..... Ulster Park, NY
Daniel Robert Shepherd ..... Gibsonville
**Kirk Darin Sherrill ..... Mooresville
Joseph Shiteyia Shiluli ..... Raleigh
Sherri Lynn Simpson ..... Arlington, VA
James Neal Singletary ..... Raleigh
**Stephen Moyers Strand ..... Greensboro
Dowon Rick Suh ..... Charlotte
Dean Shea Thomas ..... Mount Airy
Ronald William Timm ..... Creedmoor
Christopher Shane Tucker ..... Charlotte
Curtis Clay Tucker ..... Grifton
Joseph Blair Tyson ..... Cary

BACHELOR OF SCIENCE IN NUCLEAR ENGINEERING

Degree Conferred August 7, 1990

Thomas Morello, Jr. ..... Forked River, NJ

Degree Conferred December 19, 1990

Jonathan David Moore ..... Havelock

College of Forest Resources

BACHELOR OF SCIENCE IN CONSERVATION

Jointly administered by the College of Forest Resources and the College of Agriculture and Life Sciences.

Degrees Conferred December 19, 1990

David Bryan Jones ..... Roxboro

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Lauren Elizabeth Kolodij ..... Durham
†Michele Lynn Spersrud ..... Zebulon

BACHELOR OF SCIENCE IN FORESTRY

Degrees Conferred June 26, 1990

Larry Steven Hyde ..... Raleigh
Deborah Lynn Nahikian ..... Edgewater, FL
Eugene Gerald Raynor ..... Goldsboro
Terry Vann Sparrow, Jr. ..... Belhaven

Degree Conferred August 7, 1990

Christopher Thomas Cobb ..... Tarboro

Degrees Conferred December 19, 1990

Thomas John Margo ..... Greenville, SC
†Brent Jerald McClendon ..... Raleigh
Brad Derek McGuire ..... Sugar Creek
Anthony Russell Meadows ..... Maysville

BACHELOR OF SCIENCE IN PULP AND PAPER SCIENCE AND TECHNOLOGY

Degrees Conferred August 7, 1990

James Alan Durkee ..... Rock Hill, SC
Stephen Lap Nguyen ..... Pisgah Forest

Degrees Conferred December 19, 1990

James Todd Coltrain ..... Pantego
**Larry Scott Jackson ..... Ashland, VA
†Bernardo A Jurado-Blanco ..... Maracay, Venezuela
†Melinda Joyce McDaniel ..... Warner Robins, GA
Dennis William Singleton ..... Canton
Ronald Lee Smith ..... Brunswick, GA
Steven Robert Spencer ..... Gastonia

BACHELOR OF SCIENCE IN RECREATION RESOURCES ADMINISTRATION

Degree Conferred June 26, 1990

Joseph Scott Campbell ..... Chapel Hill

Degrees Conferred August 7, 1990

Lee-Ann Toler O'Neal ..... Louisburg
William DuBose Picquet ..... Charleston
Mary Jean Pope ..... Cedar Grove

Degrees Conferred December 19, 1990

Dawn Miranda Franklin ..... Richmond, VA
Stephen Andrew Gaertner ..... Raleigh
Jerilyn Highfill ..... Apex
Robert Thomas Hodge ..... Garner
Patty Sue Lake ..... St. Paul, MN
Gary William Mills ..... Raleigh
John Robert Moss ..... Greensboro
Kevin Andrew Young ..... Catonsville, MD

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF SCIENCE IN WOOD SCIENCE AND TECHNOLOGY

Degree Conferred August 7, 1990

Paul Xavier Taylor ..... Burlington

Degree Conferred December 19, 1990

Roman Morris ..... Statesville

College of Humanities and Social Sciences

BACHELOR OF ARTS IN ACCOUNTING

Degrees Conferred June 26, 1990

Alan Philip Courtney Bannister ..... Toms River, NJ
Elizabeth Colvin Berry ..... Southport
Charmette Eskomita Brown ..... Paulsboro, NJ
Thomas Bruce Brown ..... Ripley, WV
William Robert Carey ..... Kingston, NY
*William Warner Chamberlain ..... Greensboro
Sharon Paige Dunn ..... Burlington
Beth Anne Gilpin ..... Newport
*Julie Ann Jones ..... Lake Katrine, NY
Mary Allyson Lasley ..... Sanford
James Gray McAllister IV ..... Hickory
Jon Eric Merriman ..... Madison
Robert Roosevelt Rice ..... Mount Olive
Nancy Lorraine Terry ..... Albemarle
*Karen Dickerson Turner ..... Louisburg
Jane Elizabeth Varner ..... Cary
Melissa Jane Walker ..... Charleston, WV

Degrees Conferred August 7, 1990

Melissa Batchelor Brewer ..... Jacksonville
†Kevin Wayne Coats ..... Willow Springs
Mark Leo Henson ..... Havelock
Matthew Stephen Hutnan ..... Raleigh
Richard Alan McCall ..... Lexington
Jeffrey William Meigs ..... Jacksonville
Katretia Diane Britt Moose ..... Rocky Mount
Joseph Warren Nowell ..... Elizabeth City
Ethel Harriet Priestley ..... Greensboro

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Lisa Anne Prunty ..... Greensboro
Charles Maurice Young ..... Raleigh

Degrees Conferred December 19, 1990

James Steven Baker ..... Clayton
†Benjamin Gerard Barbour ..... Raleigh
**Joanne Marian Bognet ..... Raleigh
Charlotte Ann Campbell ..... Cary
†Corey Leon Carter ..... Monroe, CT
Jeffrey Todd Gardner ..... Wilmington
Kelly Elizabeth Green ..... Louisburg
†Brad Lamont Hamilton ..... Lincolnton
Elizabeth Virginia Hayes ..... N. Scituate, MA
†Brigette Monique Hendrix ..... Fayetteville
Brian Scott Jackson ..... Fayetteville
†Peter Gregory Jackson ..... Pinehurst
Gaylon Everette King ..... Cary
Robbie Lavon Moye ..... Goldsboro
†Thomas Victor Pair ..... Knightdale
Jenese Johnson Patanella ..... Raleigh
Yuri Christina Pence ..... Graham
Angela Maria Spiller ..... Fayetteville
Clifton Gerald Stephens ..... Sanford
Talmadge Ray Wall, Jr. ..... Knightdale

BACHELOR OF ARTS IN BUSINESS MANAGEMENT

Degrees Conferred June 26, 1990

David Jay Bailey .....
†Releata Evelyn Baker ..... Rose Hill
Martha Vinson Beaver ..... Garner
†Keith Joseph Bettex ..... Huntington, NY
Douglas Todd Buff ..... Morganton
†Timothy Leroy Bunce ..... Cary
David Douglas Butcher ..... Raleigh
James McGregor Carr ..... Raleigh
Christina Hae Won Chang ..... Charlotte
Andrea Renee' Chiles ..... Raleigh
Christopher Thomas Christian ..... Lumberton
Tyrus Raymond Cobb III ..... Charlotte
†Marcus Avery Danzy ..... Walnut Cove
Heather Lorraine Dietz ..... Raleigh
†Carl Lee Eason, Jr. ..... Brooklyn, NY
Lee Stuart Elson, Jr. ..... Cedar Grove, NJ
**Stephen Michael Fabian ..... Cleveland, OH
*William Thomas Fowler ..... Cary
†**Myron Stanley Herron, Jr. ..... Burlington
William Dasher High, Jr. ..... Fayetteville
Brian Todd Huggins ..... Raleigh
Samantha Michelle Jamgochian ..... Olney, MD
Karen Elizabeth Johnson ..... Asheville
William Anton Juhas ..... Raleigh
Jae Anne Lamb ..... Charlotte
Sarah Denise Lang ..... Greenville
Russell Eugene Lanning ..... LaGrange
†Mary Grady Lindsay ..... Waynesboro, VA
Julie Michelle McKee ..... Durham
Heena Manish Mehta ..... Chapel Hill

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Michael Lewis Miller ..... Hickory
Clark Todd Norris ..... Hickory
Lionel Drew Olmstead ..... Atlanta, GA
Sandrina Lucille Osborne ..... Brooklyn, NY
Robert White Payne ..... High Point
†*Kent Robert Renner ..... Raleigh
†Thomas Edward Roberts, Jr. ..... Charlotte
†Ryan Karl Rosa ..... Salisbury
Daniel Ward Russell ..... Raleigh
Steven Wesley Settlemyre ..... Rocky Mount
Robert Scott Shafer ..... Raleigh
Richard Wesley Sheets ..... Fuquay-Varina
Scott Darris Shue ..... Salisbury
†David Woodley Spencer ..... Kill Devil Hills
*Rebecca Lynne Splawn ..... Burlington
Tracy Ann Sterck ..... Roswell
Carl Ray Stevens ..... Smithfield
Terry Marcus Swaim, Jr. ..... Salisbury
Kurt Duncan Tugman ..... Raleigh
Don Robert Watson ..... Wilson
Virgil Parker Whitehurst ..... Belvidere
**Matthew Cole Williams ..... Clayton
Audra Marie Wright ..... Aydlett

Degrees Conferred August 7, 1990

David Paul Beach ..... Durham
Levette Blount ..... Raleigh
Jeffrey Dale Bunner ..... Jacksonville
Julie Michelle Burris ..... Raleigh
Michael Dean Burton ..... Asheville
Catherine Marie Clontz ..... Raleigh
†Kevin Wayne Coats ..... Willow Springs
William Jeffrey Cobb ..... Raleigh
†Allen Dunlap Copeland ..... Durham
Garland Raynard Edgerton ..... Greensboro
†Brian Thompson Ezzelle ..... Wilson
Marvin Spotswood Ferrell ..... Winston-Salem
John Edmond Fishburne ..... Greensboro
Joseph Henry Fleming V ..... Charlotte
Rhonda Hanna Garrett ..... Enterprise, AL
William Richard Helms ..... Goldsboro
Mary Susan Hoffman ..... High Point
Tammy Early Holloway ..... East Palestine, OH
Robert Harry Hughes ..... Morristown, NJ
Brian Scott Jackson ..... Fayetteville
Jennifer Carole Lance ..... Asheville
John Charles Linn ..... Raleigh
Christopher Baldwin Lynch ..... Charlotte
Gregory William Miller ..... Asheville
†***Melissa Ruth Neal ..... Cary
David Brian Newberry ..... Raleigh
Casaundra Michelle Owens ..... Lexington
Clarence Ray Pegram, Jr. ..... Henderson
Amy Ruth Rowland ..... Garner
Janet Elaine Rutkowski ..... Raleigh
Tina Louise Saavedra ..... Saint Petersburg, FL
Jane Elizabeth Sears ..... Raleigh
†Richard Sean Spivey ..... Wilmington
Robert Paul Stanley, Jr. ..... Wilmington

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

*John Carlos Stiles ..... Cary
Gail Marie Tripp ..... Raleigh
Denise Kenya Tunnell ..... Baltimore, MD
Janice Candice Tunnell ..... Baltimore, MD
Clifton Benjamin Vann IV ..... Charlotte
Joseph Graham White, Jr. ..... Fuquay-Varina
Kathleen Marie Wilson ..... Statesville

Degrees Conferred December 19, 1990

Berta Ramez Al-Chacar ..... Oxford
*†Michael James Baker ..... Raleigh
Alan Philip Courtney Bannister ..... Toms River, NJ
Michael Blaine Barbee ..... Tampa, FL
†Benjamin Gerard Barbour ..... Raleigh
Robert Cunnett Barbour ..... Concord
Brent Cortney Barrett, Jr. ..... Cary
Kenneth Errol Baynes, Jr. ..... Jamestown
Anne Marie Beck ..... Cary
Clara Naomi Behar ..... Greensboro
Mark Allen Benson ..... Lorton, VA
*Virginia Elisabeth Berry ..... Atlanta, GA
John Richard Biddix, Jr. ..... Marion
Greg Robert Biehn ..... Columbus, OH
Zane Ray Brisson, Jr. ..... Southern Pines
Victor Wayne Britt ..... Raleigh
Edwin Borden Broadhurst III ..... Raleigh
Mark Christopher Brown ..... Moyock
Lorraine Marie Butler ..... Charlotte
John Stewart Byrd ..... Wilson
Coreena Louise Cannon ..... Raleigh
***Patricia Anne Capozzoli ..... Boca Raton, FL
†Corey Leon Carter ..... Monroe, CT
Peter Alexander Chatt ..... Ramey, Puerto Rico
Ettrick DeMorris Coley ..... Wilmington
†Bart Hammond Crum ..... Raleigh
Kristal Kay Crutchfield ..... Raleigh
†Harry Morton Davis IV ..... Kernersville
Paul Christopher Densmore ..... Raleigh
*Jennipher Ness Dillard ..... Raleigh
Shannon Theresa Duffey ..... New Bern
*JoAnn Marie Emerson ..... Anderson, IN
Stephen Adam Engelson ..... Bridgeport, CT
†***Charles Edward Ettridge ..... Marshfield, MA
†Robert James Farmer ..... Gastonia
Candace Harrell Fleming ..... Raleigh
West Leary Forehand, Jr. ..... Raleigh
†Steven Timothy Foss ..... Jacksonville
Jorge Ignacio Franchi ..... Fairfax, VA
Thomas Benjamin Gandolph, Jr. ..... Raleigh
Scott Adam Goldenberg ..... Staunton, VA
John Alexander Goodman ..... Raleigh
†William Nolan Goodwin, Jr. ..... Raleigh
Windell Hermond Gorham ..... Roxobel
†Brad Lamont Hamilton ..... Lincolnton
Susan Kaye Hamm ..... Durham
†Mary Candace Haney ..... Charlotte
Daniel William Hardy ..... Whitsett

John Turner Harris ..... Richmond, VA
Linda Kelley Harris ..... Durham
Richard Irvin Harris ..... Richmond, VA
†Philip Bruce Hartung ..... Salisbury
Michael Henry Harwell, Jr. ..... Raleigh
†***Mark Howard Hasty ..... Raleigh
†Brigette Monique Hendrix ..... Fayetteville
Teresa Lynn Hicks ..... Roxboro
Michael Andrews Hinton ..... Raleigh
†Judith Elaine Holloway ..... Charlotte
William Douglas Holt ..... Conover
†Laura Leigh Hooper ..... Vienna, VA
†Michael Anthony Howell ..... Wilmington
†Jeffrey Clark Howerton ..... Kernersville
Georgia Ikonomou ..... Greece
†Thomas McDougall Israel ..... Raleigh
†Peter Gregory Jackson ..... Pinehurst
Keun Woo Jon ..... High Point
Derick Edward Jones ..... Charlotte
Robert Warren Jurgens ..... Raleigh
Athena Kabylafkas ..... Marlton, NJ
Girish Pratap Karamchandani ..... Raleigh
Michael John Kavulic ..... Marietta, GA
†Michelle Lynn Kerry ..... Charlotte
†Rizgar Khoshnaw ..... Raleigh
Kevin Mark Klimczyk ..... Olean, NY
†David Lee Kurtz, Jr. ..... Raleigh
†John Edward Lackey, Jr. ..... Taylorsville
Peirson Freeman Lane ..... Rocky Mount
Tamara Renee Lane ..... Tyner
Joseph Adrien Lavigne, Jr. ..... Jacksonville
Anna Anderson Leary ..... Wallace
Robert Edward Lee ..... Greensboro
Roger Christopher Lee ..... Kinston
†Stavros George Liakakos ..... Raleigh
Cheryl Evette Lindsay ..... Winston-Salem
John Keith Little ..... Woodbridge, VA
Jennifer Lynn Manning ..... Asheville
†*Susan Rebecca Maxwell ..... Rockville, MD
James Gray McAllister IV ..... Hickory
Phillip Todd McCartney ..... Raleigh
Catherine Maureen Meloling ..... Raleigh
John Hartley Mennear ..... Raleigh
Jon Eric Merriman ..... Madison
Teresa Elizabeth Milan ..... Durham
*Linda Steckenrider Miller ..... Raleigh
Christopher Alan Moore ..... Smithfield
†*Tracy Ray Moore ..... Pinnacle
**Stephen Walter Morse ..... Rudgwick, England
Lee Currin Gooch Murray ..... Macon, GA
†Brian Keith Nance ..... Asheboro
Laura Lee Nicholson ..... Mannheim, Germany
†Wade Hampton Owens ..... Jacksonville
Erica Yvon Pace ..... Louisville, TN
†Thomas Victor Pair ..... Knightdale
*Michael Aaron Paoletti ..... Aiken, SC
Amy Landis Parker ..... Marion
Cynthia Lee Parker ..... Raleigh

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Thomas Michael Parkin ..... Raleigh
†Ashley Heath Patterson ..... Trinity
James Raymond Patterson ..... Fayetteville
Henry Avon Perry, Jr. ..... Newton Grove
†Michelle Ann Pfeiffer ..... Raleigh
Robert Jackson Pickard III ..... Greensboro
Steven McCoy Pilkington ..... Smithfield
Barbara Jean Proctor ..... Apex
Walter Haywood Purvis ..... Henderson
Husam Yousef Rayyan ..... Raleigh
Herbert Cyrus Richardson ..... Louisburg
***Kimberly Dawn Ridout ..... Morrisville
James Miller Ross, Jr. ..... Claremont
Traci Suzanne Rouse ..... Kinston
Jolie Rae St Pierre ..... Gastonia
Robert Lee Scherer, Jr. ..... Cary
Mark Daniel Schiewe ..... Rocky Mount
John Duncan Schilling ..... Columbia, MO
†Frederick Michael Schneider ..... Great Falls, VA
Paul Franklin Sipe ..... Hickory
William Cola Slade, Jr. ..... Silver Spring, MD
Britton Scott Smith ..... Lexington
Donna Kaye Smith ..... Kinston
Sharon DeVette Stanback ..... Southern Pines
*Jennifer Lynn Stearns ..... Raleigh
Brian Matthew Stone ..... Cape Elizabeth, ME
Wesley Neil Styers ..... Gastonia
Dennis Hayes Sullivan, Jr. ..... Raleigh
Andrea Leigh Sutherlin ..... Stem
James Blake Tharin ..... Rocky Mount
Agnes Linnette Thompson ..... Pinehurst
**Gary Randall Tolliver ..... Kinston
†Brian Nelson Top ..... Gaithersburg, MD
Sanjiv Thakor Topiwala ..... Charlotte
†Gregory Laurence Treanor ..... Burlington
†Steven Michael Trease ..... Newton, IA
†Robert Francis Tyynismaa ..... Jacksonville
*Elizabeth Marie Van den Bout ..... Apex
Christopher Shay Walsh ..... Longwood, FL
†*Paul Richard Walter ..... Ridgefield, CT
Jeffrey Charles Webster ..... Randallstown, MD
†*Jerry Matthew Williams ..... Raleigh
*Scott Emory Wilson ..... Whortonsville
Harry Alan Woodard ..... Jacksonville
William McDonnell York ..... Raleigh

BACHELOR OF ARTS IN ECONOMICS

Degrees Conferred June 26, 1990

†Releata Evelyn Baker ..... Rose Hill
†Keith Joseph Bettex ..... Huntington, NY
†Timothy Leroy Bunce ..... Cary
Latanya Demetria Clemons ..... Chapel Hill
†Marcus Avery Danzy ..... Walnut Cove
†Carl Lee Eason, Jr. ..... Brooklyn, NY

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

†**Myron Stanley Herron, Jr. ..... Burlington
Jennifer Carole Jackson ..... Atlanta, GA
†Mary Grady Lindsay ..... Waynesboro, VA
†*Kent Robert Renner ..... Raleigh
†Thomas Edward Roberts, Jr. ..... Charlotte
†Ryan Karl Rosa ..... Salisbury
Leslie Diane Silva ..... Wayne, PA
†David Woodley Spencer ..... Kill Devil Hills
Steven Wayne Wood ..... Raleigh

Degrees Conferred August 7, 1990

Karen Beth Beane ..... Bethesda, MD
†Brian Thompson Ezzelle ..... Wilson
Walter Haywood Purvis ..... Henderson
Lena Ladendra Rollinson ..... Wilmington
†Richard Sean Spivey ..... Wilmington

Degrees Conferred December 19, 1990

*†Michael James Baker ..... Raleigh
John Willis Chamberlain, Jr. ..... Raleigh
†Bart Hammond Crum ..... Raleigh
†Harry Morton Davis IV ..... Kernersville
†Robert James Farmer ..... Gastonia
†Steven Timothy Foss ..... Jacksonville
†William Nolan Goodwin, Jr. ..... Charlotte
†Mary Candace Haney ..... Charlotte
†Philip Bruce Hartung ..... Salisbury
†***Mark Howard Hasty ..... Raleigh
Larry Randall Heavener, Jr. ..... Kernersville
†Judith Elaine Holloway ..... Charlotte
Xu Hong ..... Raleigh
†Laura Leigh Hooper ..... Vienna, VA
†Michael Anthony Howell ..... Wilmington
†Jeffrey Clark Howerton ..... Kernersville
†Thomas McDougall Israel ..... Asheville
†Michelle Lynn Kerry ..... Charlotte
†Rizgar Khoshnaw ..... Raleigh
†David Lee Kurtz, Jr. ..... Raleigh
†John Edward Lackey, Jr. ..... Taylorsville
†Stavros George Liakakos ..... Athens, Greece
†*Tracy Ray Moore ..... Pinnacle
†Brian Keith Nance ..... Asheboro
†Wade Hampton Owens ..... Jacksonville
Clarence Ray Pegram, Jr. ..... Henderson
Charles Thaddeus McKenzie Roberts ..... Raleigh
†Frederick Michael Schneider ..... Great Falls, VA
Julie Curtis Spence ..... Hillsborough
Michael Kyle Stillie ..... Winston-Salem
†Brian Nelson Top ..... Gaithersburg, MD
†Gregor Laurence Treanor ..... Burlington
†Steven Michael Trease ..... Newton, IA
†Robert Francis Tyynismaa ..... Jacksonville
†*Paul Richard Walter ..... Ridgefield, CT
†*Jerry Matthew Williams ..... Raleigh

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

BACHELOR OF SCIENCE IN ECONOMICS

Degrees Conferred June 26, 1990

Timothy Gene Marshburn ..... Wilmington
Christopher David Parks ..... Pfafftown

Degrees Conferred December 19, 1990

†John Raymond Acker ..... Garner
Raymund Custer ..... Wilmington
John Roger Grove, Jr. ..... Greensboro

BACHELOR OF ARTS IN ENGLISH

Degree Conferred June 26, 1990

Everett Thomas Eckard ..... Hickory

Degrees Conferred August 7, 1990

**Dorothy Moras Altman ..... Raleigh
John Scott Austin ..... Greensboro
John Lee ..... Charlotte
Tonya McLaurin ..... Fayetteville

Degrees Conferred December 19, 1990

Beth Ann Alley ..... Raleigh
Victor Paul Blizard, Jr. ..... Raleigh
Judith Lynn Bouché ..... Cary
Kimberly Paige Boyd ..... Raleigh
Kristie Anne Boyette ..... Raleigh
Ann Wilson Clegg ..... Hickory
Timothy Brett Clodfelter ..... Winston-Salem
Debora Lynn Conrad ..... Wallace
Caroline Christine Cortina ..... Raleigh
Dawn Love DeBruhl ..... Winston-Salem
†***Charles Edward Ettridge ..... Marshfield, MA
Patricia Churn Fentress ..... Washington
Laura Elaine Fuller ..... Greensboro
John Robert Gamble, Jr. ..... Cary
Melissa Larkin Gibson ..... Charlotte
Rachel Leah Goldstein ..... Bayside, NY
Kurt Patrick Gorritz ..... Miami, FL
Marian Acrey Grissom ..... Henderson
**Jennifer Kim Hall ..... Raleigh
Reid Jackson Hardin ..... Winston-Salem
Lisa Renee Hearne ..... Garner
Tracey Lynne Hinson ..... Charlotte
Krista Lee Howard ..... Charlotte
Mark David Jenkins ..... Waldorf, MD
Anne Margaret Johnson ..... Raleigh
Lisa Katherine Lambert ..... Raleigh
Robert Benjamin Mace ..... Smyrna, DE
Curt Richard Mackey ..... Cary
*Victor Ward Matthews, Jr. ..... Raleigh
Sylvia Kay McAlister ..... Biscoe
Lee Arthur Montgomery ..... Garner
Courtney Ann Pelt ..... Raleigh
Beth Ann Penny ..... Benson
Lisa Suzanne Pignetti ..... Charlotte

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Sarah Marie Pritchard ..... Cary
***Kimberly Lynn Rowell ..... Garner
Peggy Mary Salvatore ..... East Northport, NY
Donn Augusta Snipes ..... Morganton
Paulette Melissa Verdell ..... Winston-Salem
Joseph Preston Wofford III ..... Raleigh
Cynthia Michelle Ray Woolard ..... Raleigh

BACHELOR OF SCIENCE IN ENGLISH

Degree Conferred December 19, 1990

Stephen David Peck ..... Charlotte

BACHELOR OF ARTS IN HISTORY

Degrees Conferred June 26, 1990

Kenneth Lamar Fondren, Jr. ..... Hartford, AL
Hunter Thompson George II ..... Raleigh
Carter Hamilton Hunt ..... Greensboro
**Karen Branson McDonald ..... Cary
***Deborah Robinson Ritsema ..... Raleigh
Corbin Brian Shell ..... Pinebluff
Rosalind Siegrist ..... San Antonio, TX

Degrees Conferred August 7, 1990

Susan Renee Adkins ..... New Bern
William Hunt Archbold ..... Atlanta, GA
Geoffrey Dean Brooks ..... Greensboro
Romulus Sanderson Spencer III ..... Engelhard
Christopher Thomas Szanto ..... Poughkeepsie, NY
Dwayne Andre White ..... Oak City

Degrees Conferred December 19, 1990

Edward Anderson Case ..... Macon
Patrick Walther Casseday ..... Durham
James Randolph Giles ..... Lynchburg, VA
Wendy Luann Griffin ..... Raleigh
*David Lee Harris ..... Conover
David Martin Honeycutt ..... High Point
William Thomas Jackson ..... Bailey
***Marian Jeanne Johnson ..... Raleigh
John Anderson Keadle ..... Cary
Douglas Brian Lee ..... Vanceboro
Darrell Wayne Parnell ..... Abbeville, SC
†Ashley Heath Patterson ..... Trinity
**Lori Adams Reed ..... Durham

BACHELOR OF ARTS IN MULTI-DISCIPLINARY STUDIES

Degrees Conferred June 26, 1990

Derrick Lamont Cook ..... Raleigh
Joel Stephen Johnson ..... Bladenboro

Degrees Conferred August 7, 1990

Sadri Gjonbalaj ..... Brooklyn, NY
***Mary Ann McVicker ..... Lincoln, NE

† Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Robert Bradley Rhodes ..... Clemmons
Sandra Kay Woodson ..... Short Gap, VA
***Susan Hackbarth Young ..... Garner

Degrees Conferred December 19, 1990

Sandra Jean Maki Hazen ..... Westminster, MA
Paul Jarett Hinson ..... Albemarle
*Nicole Marie Langford ..... Raleigh
Judith Marshall Lowery ..... Wake Forest
†*Sharon Elizabeth Pope ..... Garner
†Marjorie Johnice Smith ..... Durham
John Wesley Wilkinson ..... Charlotte

BACHELOR OF ARTS IN PHILOSOPHY

Degree Conferred June 26, 1990

Sara Elise Hooper ..... Raleigh

Degrees Conferred December 19, 1990

†**Scott Edward Allen ..... Saint Pauls
James Steven Chapman ..... Moncks Corner, SC
Douglas Wayne Edsall, Jr. ..... Ft. Lauderdale, FL
Shelley Kristine Kruse ..... Barrington Hills, IL

BACHELOR OF ARTS IN POLITICAL SCIENCE

Degrees Conferred June 26, 1990

Sterling Lane Baker ..... Cary
John David Lambright ..... Wilmington, DE
Richard Dirk Selland ..... Salisbury, MD

Degrees Conferred August 7, 1990

Kelvin Cherry ..... Lewiston
Jonathan Paul DeHart ..... Raleigh
David John Ferris, Jr. ..... Wilmington
Jocelyn Marie Gailor ..... Raleigh
Lara Michelle German ..... Boomer
Robert Brittain Irwin ..... Burlington
Kevin Michael Lynch ..... Baldwin, NY
*Tracy Danette Turner ..... Mount Holly

Degrees Conferred December 19, 1990

†**Scott Edward Allen ..... Saint Pauls
Gregory Thomas Beam ..... Salisbury
Christopher Clark Bone ..... Penscola, FL
David Fletcher Bullard ..... Wilmington
James Will Creech, Jr. ..... Huntersville
Margaret Josephine Exum ..... Rocky Mount
Christopher Gale Fry ..... Apex
Anthony Reynolds Hale ..... Aulander
David Wesley Heiman ..... New Bern
Christopher Lee Helms ..... Charlotte
Michelle Leigh Holland ..... Fayetteville
Ferrell Lee Jones, Jr. ..... Tabor City
Charles Russell Knight ..... Raleigh

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Anne Teresa Leach ..... Columbia, MD
Elaine Lynn McKay ..... Maiden
BridgetAnn Kathryn McLain ..... Raleigh
James Franklin Meade, Jr. ..... Durham
Michael Chalmers Middleton ..... Charlotte
Alden Patrick Miller ..... Elizabeth City
Alan William Mitchell ..... Raleigh
Diana Lynn Moore ..... Charlotte
Keri Jean Reilly ..... Kingston, NY
David Hampton Sewell ..... Wilmington
Paul C. Slechta ..... Winston-Salem
Toby Edgecumb Symonds ..... Raleigh
Erik Jason Trumpower ..... Charlotte
William Mark Twilla III ..... Charlotte
William Coefield Wiggins, Jr. ..... Grifton

BACHELOR OF ARTS IN SOCIOLOGY

Degrees Conferred June 26, 1990

Charles Reed Allen ..... Charlotte
*Diane Elizabeth Juhas ..... Raleigh
David Andrew Paynter ..... Goldsboro
Elizabeth Lawrence Ramsey ..... Shelby
Kathleen Elizabeth Woodward ..... Statesville

Degrees Conferred August 7, 1990

Maria Lisa Gilbert ..... Laurinburg
Kenneth Raymond Lentz ..... Raleigh
Derrick Neil McCraw ..... Greensboro
Volire DeCarlo Tisdale ..... Greensboro

Degrees Conferred December 19, 1990

Amy Rene Castor ..... Salisbury
Brian Thomas Flannery ..... Garner
Jennifer Kay Jenkins ..... Matthews
James Edward McElroy II ..... Morehead City
Kelly Ann McNelis ..... Fuquay Varina
*Marlee Elizabeth Moore ..... New Bern
Brian Edward Raitz ..... Kannapolis
Farron Stacy Riggs ..... Gaithersburg, MD
Alexandra Lara Rohde ..... Charlotte
Charles Cleveland Staley ..... Sanford
Karen Marie Williams ..... Raleigh
Cynthia Lynn Wright ..... Raleigh

BACHELOR OF ARTS IN SPANISH LANGUAGE AND LITERATURE

Degree Conferred June 26, 1990

Sarah Katherine Hogarty ..... Westhampton, NY

Degrees Conferred August 7, 1990

†Allen Dunlap Copeland ..... Durham
Rebecca Jean Colby ..... Graham
†***Melissa Ruth Neal ..... Cary

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Degrees Conferred December 19, 1990

Tracey Dawes Cox ..... Raleigh
Thanh Le Duc Dinh ..... Raleigh
Tatiana Maria Haas-Castro ..... St. Louis, MO
†*Susan Rebecca Maxwell ..... Rockville, MD

BACHELOR OF ARTS IN SPEECH COMMUNICATION

Degrees Conferred June 26, 1990

Valerie Dawn Clark ..... Raleigh
Susan Jane Dickey ..... New Bern
Vivian Dawnn Diggs ..... Newark, NJ
*Willie Robert Dudley, Jr. ..... Asheboro
Melody Rae Hall ..... Eden
Joy Griffin Jones ..... Nashville
Trent Steven McCranie ..... Lakeland, FL
Wanda Forletta McIntosh ..... Kannapolis
Maria Nixon ..... Raleigh
Kenneth Brad Walser ..... Salisbury
Kimberly Payne Willcox ..... Raeford
Paul Floyd Woolverton, Jr. ..... Raleigh

Degrees Conferred August 7, 1990

Heather Maria Cheek ..... Chapel Hill
Carlynn Sue Davey ..... Apex
John Dana German ..... Boomer
Thomas Brent Huminik ..... Great Falls, VA
Kimberly Denise Ivey ..... Rockingham
Krista Rea Kilburn ..... Fayetteville, GA
Paul Andra Kinlaw ..... Jacksonville
Karla Ann Odeen ..... McLean, VA
Kelly Kiernan Piggott ..... Lynchburg, VA
Terry Reese, Jr. ..... Orlando, FL
Christa Anne Traber ..... Asheville
Elizabeth Eva Wall ..... Marion
Elizabeth Hartness Wilkins ..... Charlotte

Degrees Conferred December 19, 1990

Corinne Melissa Acasio ..... New Bern
Comell Theodore Baroody ..... Winston-Salem
William Timothy Batts ..... Cary
Robert Paul Brown ..... Newport News, VA
Michael Durant Brownlee, Jr. ..... Fayetteville
Kristin Ann Bryant ..... Raleigh
Susan Catherine Bullock ..... Salisbury
Mary Florence Campbell ..... Jacksonville
John David Clagett ..... Raleigh
Frances Jordan Dahlgren ..... Washington
Sarah Dianne Dale ..... Marion
Stephanie Elizabeth DiCaprio ..... Hurley, NY
Tonia Heaton Diggs ..... Hamlet
*Michelle Wilkinson Dobbs ..... Cary
Wallace Arrington Duke III ..... Raleigh
Donna Kay Epley ..... Lexington

Melody Gardner Eshak ..... Ayden
Kelly Ann Finnerin ..... Randolph
Teresa Lynn Fisher ..... Raleigh
Kenneth Thomas Fore ..... Laurinburg
**Kathleen Janet Frazer ..... Charlotte
Michael David Frontiero ..... Raleigh
Paul Brandon Gamewell ..... Salisbury
***Patrick William Garrett ..... Roanoke, VA
Laura Jane Godwin ..... Greensboro
David Lee Greenwell ..... Salisbury
*Catherine Lynn Hage ..... Vineland, NJ
Sonja Raquel Harlow ..... Roanoke Rapids
Helen Leah Hayes ..... Raleigh
Rhodney Verdell-Olanda Hunt ..... Cambria Heights, NY
Casondra Renee Hunter ..... Laurinburg
*Dana Michelle Inge ..... Forest, VA
Jennifer Lynn Jolles ..... Penn Valley, PA
Kristina Rebecca Kalnin ..... Raleigh
William Bruce Lennon ..... Wilmington
Christopher Noel Lutkowski ..... Basking Ridge, NJ
Aaron Keith McCullough ..... High Point
Jamie Leigh Metcalf ..... Bakersville
Tracye Taylor O'Bannon ..... Greenville
Tracy Jo Paulson ..... Henderson
†Michelle Ann Pfeiffer ..... Raleigh
Martha Drew Pinckney ..... Wilmington
**Kerry Lynn Polglase ..... Raleigh
Leslie Britt Price ..... Raleigh
Robin Michele Ray ..... Burlington
Phil Allan Reese II ..... Raleigh
Katherine Drewry Reid ..... Wilmington
Sheldon Martin Routh ..... Greensboro
Elizabeth Epley Sawyer ..... Raleigh
Myrna Lynn Sawyer ..... Raleigh
Shawn Lee Shoffner ..... Burlington
Nataline Ann Sloop ..... Kannapolis
Sarah Melissa Small ..... Newark, DE
Allen Keith Smith ..... Raleigh
Gene Carlton Stephenson, Jr. ..... Angier
Kathryn Ann Sullivan ..... Fredericksburg, VA
*Molly Lynn Tallent ..... Durham
Donna Terri Williams ..... Matthews
James Edwin Wrigglesworth, Jr. ..... Kenbridge, VA

BACHELOR OF SOCIAL WORK

Degrees Conferred June 26, 1990

Karen Bullock ..... Henderson
*Jennifer Annette Russell ..... Yanceyville
Patricia Suzanne Sanders ..... Fort Myers, FL

Degrees Conferred August 7, 1990

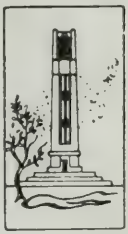
Anne McNeill Laviner ..... Wagram
Wendy Marie Malkowski ..... Raleigh
Robert Edward Neal III ..... Raleigh
Lisa Louise Smith ..... High Point

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Degrees Conferred December 19, 1990

Maria Suzanne Adams ..... Hendersonville
Cheryl Geneen Donahue ..... Greensboro
***Amy Elizabeth Friend ..... Frostburg, MD
*Elizabeth Anne Hale ..... Cary
Marcia Ann Harrison ..... Kannapolis
*Kirsten Elizabeth Hewitt ..... Chapel Hill
Anna Marie Lopez ..... Jacksonville
***Darcy Clay-Fleming Siebert ..... Raleigh
Katherine Frances White ..... Raleigh

College of Physical and Mathematical Sciences



BACHELOR OF ARTS IN CHEMISTRY

Degrees Conferred June 26, 1990

Sandra Elizabeth Cathcart ..... Raleigh
†Philip Ansel McClellan ..... Shelby
George John Sawyer IV ..... Charlotte
James H. Williams ..... Winston-Salem

Degrees Conferred August 7, 1990

Clayton Keith Carter ..... Wallace
***Joseph Richard DePrisco ..... Raleigh
Brian Lee Hass ..... Newton
Marcus Levon Leathers ..... Rocky Mount
H†*Darlene Brown Medford ..... Cary
*Sonya Lynnette Windham ..... Bennettsville, SC

Degrees Conferred December 19, 1990

†John Raymond Acker ..... Garner
***Leslie Marie Anstey ..... Raleigh
†*Stephen Donald Benjamin ..... Charlestown, IN
*Philip Julian Bradley ..... Savannah, GA
Autumn Renee Chapman ..... Franklinton
†Paul Marshall Duncan ..... Richmond, VA
†*Michael Joseph Goodheart ..... Raleigh
Kimberly Michelle Henry ..... Brooklyn, NY

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

†Bryan Wayne Kluttz ..... Kannapolis
†*Lora Ann Long ..... Apex
†*Kelly Lynn Prelipp ..... Charlotte
†**Harlan Luke South ..... Richmond, VA
Scott William Tease ..... Jacksonville
Tracy Edmund Thompson ..... Mt. Gilead
†Gregory Tyrone Worsley ..... Raleigh

BACHELOR OF SCIENCE IN CHEMISTRY

Degrees Conferred August 7, 1990

*Charles Edward Bailey ..... Raleigh
Jason Bradley Prabel ..... Chadds Ford, PA
David Vernon Ray ..... Kernersville
Donald Curtis Robertson ..... Roanoke Rapids

Degrees Conferred December 19, 1989

Robert Britt Baker ..... Cary
*Christopher Stan Cameron ..... Sanford
Mark Edward Filla ..... Whitehall, PA
†Michele Rene Lefeber ..... Morganton
Elmo Cecil Mabe, Jr. ..... Mayodan
John Mark Rogers ..... Pisgah Forest
Margaret Ann Sharkey ..... Hillsboro, OH

BACHELOR OF ARTS IN GEOLOGY

Degree Conferred December 19, 1990

Badriah Lynn Abdo ..... Bahama

BACHELOR OF SCIENCE IN GEOLOGY

Degree Conferred August 7, 1990

Glenn Shubert Shell ..... Claremont

Degree Conferred December 19, 1990

***William Alexander Lumsden ..... Raleigh

BACHELOR OF SCIENCE IN MATHEMATICS

Degrees Conferred June 26, 1990

Thomas Brooks Boyette, Jr. ..... Warsaw
Erik Donald Dahlin ..... Bethesda, MD

Degrees Conferred August 7, 1990

***Robert Benton Armstrong, Jr. ..... Sanford
Michael Eugene Davis ..... Raleigh
Parcilla Ann Harrell ..... St. Pauls
Donald Carlyle Rich ..... Raleigh

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

Degrees Conferred December 19, 1990

Rehan Ali Aziz ..... Raleigh
Chu Yong Chong ..... Jacksonville
**Terri Lynne Hefner ..... Newport News, VA
Ramonda Dea Hunter ..... Oak Ridge, TN
†Daniel Everett James ..... Burlington
**Alison Elaine Pelphrey ..... Raleigh
*Joseph Rayho ..... Monroe, CT
***Susan Patricia Samland ..... Grand Island, NY
Jerelyn Lee Sweigard ..... Raleigh
*Dana Lynn Williams ..... Monroe

BACHELOR OF SCIENCE IN METEOROLOGY

Degree Conferred June 26, 1990

Donald Brett Williams ..... Red Oak

Degrees Conferred December 19, 1990

**Edward Thomas Piotrowski ..... Jacksonville
Tommie Galbraith Tiller, Jr. ..... Baltimore, MD

BACHELOR OF SCIENCE IN PHYSICS

Degree Conferred August 7, 1990

Scott Mathew Greenough ..... Enfield, CT

Degrees Conferred December 19, 1990

David Addison Casey ..... High Point
Michael Thomas Rubes ..... Raleigh

BACHELOR OF SCIENCE IN STATISTICS

Degree Conferred June 26, 1990

Veronica Lynn Parker ..... Durham

Degree Conferred August 7, 1990

Diane Marie McCowin ..... Gaithersburg, MD

Degree Conferred December 19, 1990

Ronald Brooke Erbrecht ..... Pittsburgh, PA

College of Textiles

BACHELOR OF SCIENCE IN TEXTILE CHEMISTRY

Degrees Conferred June 26, 1990

David Eric Carpenter ..... Gastonia
Amy Elizabeth Chandler ..... New London

Degree Conferred December 19, 1990

†Michele Rene Lefeber ..... Morganton

BACHELOR OF SCIENCE IN TEXTILE AND APPAREL MANAGEMENT

Degrees Conferred June 26, 1990

**Linda Ellen Copeland ..... Greensboro
Hua Li ..... Raleigh
Christopher Dean McGuirt ..... Charlotte
Andrew Down Page, Jr. ..... Southern Pines

Degrees Conferred December 19, 1990

Terry Gale Brasier ..... Bunnlevel
William Russell Hughes III ..... Burlington
Cassandra Renee Johnson ..... Morristown, NJ
Harry Manson Leete, Jr. ..... Warrentown
Michael Todd Ludwick ..... Richfield
Melissa Mary Malloy ..... Charlotte
*Natalie Lynn McNair ..... Raleigh
Deborah Jean McVicker ..... Concord
Tracy LaVerne Perry ..... Wilmington
Ricky Dean Shoaf ..... Lexington
Lee Charles Thompson ..... Sanford
Patrick O'Neal Wood ..... Cove City

BACHELOR OF SCIENCE IN TEXTILE SCIENCE

Degree Conferred June 26, 1990

Matthew Carlton Hodges ..... Mt. Airy

Degree Conferred December 19, 1990

Joey Garland Jacobs ..... Fairmont

BACHELOR OF SCIENCE IN TEXTILES

Degrees Conferred December 19, 1990

Jill Gowan Guest ..... Charlotte
Jennifer Kaye Hrometz ..... Stoneville
Christa Michelle Lynam ..... Matthews

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

COLLEGE OF VETERINARY MEDICINE

DOCTOR OF VETERINARY MEDICINE

Degree Conferred June 26, 1990

Lee-Ann Christie ..... Raleigh

Degree Conferred August 7, 1990

Susan Williams Helton ..... Morganton

†Co-major *Cum Laude **Magna Cum Laude ***Summa Cum Laude H Honors Program

GRADUATE DEGREES

Master's Degrees

MASTER OF AGRICULTURE

Degrees Conferred August 7, 1990

Curtis Dean Fountain ..... Tarboro
Peter John Jensen ..... Orleans, MA

Degrees Conferred December 19, 1990

David Lynn Dycus ..... Sanford
Mark McCrea Keene ..... Mt. Olive
Owen Bryant Martin ..... Warsaw
Maurice Irvin McAlister ..... Marshall

MASTER OF ARCHITECTURE

Degrees Conferred August 7, 1990

John Alexander Poorman ..... Raleigh
Michael Roy Secor ..... Buffalo, NY

Degrees Conferred December 19, 1990

Alicia Bird Derry ..... Raleigh
Mona Ahmed El-Daly ..... Cairo, Egypt

MASTER OF CIVIL ENGINEERING

Degrees Conferred August 7, 1990

Richard Van Argabright ..... Winston-Salem
Gregory Scott Briggs ..... Altus, OK
William Kuo Chi ..... Chapel Hill
Samuel Thomas Roudebush ..... Raleigh
Fu-Shiung Wang ..... Kaohsiung, Taiwan, Republic of China
Charles Arthur Willis, Jr. ..... Charlotte

Degrees Conferred December 19, 1990

Alicia Carol Beard ..... Fayetteville
Linda Dosse ..... Raleigh
David Lawrence Eaddy ..... Hemingway, SC
Hediyanto Whidinugroho Husaini ..... Padang, Indonesia
Robert Edward Lasater, Jr. ..... Cary

MASTER OF COMPUTER SCIENCE

Degrees Conferred December 19, 1990

Hsiangsen Cheng ..... Taipei, Taiwan, Republic of China

MASTER OF ECONOMICS

Degrees Conferred August 7, 1990

Cynthia Marie Burns ..... Fayetteville
Yi-Ping Chen ..... Tainan, Taiwan, Republic of China
Sri Ernawati ..... Raleigh
Janq-Shiann Lin ..... Taipei, Taiwan, Republic of China
Zamhari Wahyudin ..... Palembang, Indonesia
Mohamad Hasyin Zaini ..... Jakarta, Indonesia

Degrees Conferred December 19, 1990

Can Arcasoy ..... Ankara, Turkey
John Wesley Clark ..... Atkinson
Simon John Kelly ..... Liverpool, England
Nelson José Santamaria ..... Valencia, Venezuela

MASTER OF EDUCATION

Adult and Community College Education

Degrees Conferred August 7, 1990

Muriel Irene Evans ..... Raleigh
Phyllis Elaine Helms ..... Asheboro
Sherwood Louis Williams ..... Four Oaks

Degrees Conferred December 19, 1990

Denise McIntire Baker ..... Old Fort
Janet Stallings Cumbee ..... Wake Forest
Josephine Chadwick Emmons ..... Norristown, PA

Agricultural Education

Degree Conferred August 7, 1990

James Carnie Oliver ..... Elizabeth City

Degrees Conferred December 19, 1990

Gilbert Ashley Lewis, Jr. ..... Fairmont

Curriculum and Instruction

Degrees Conferred August 7, 1990

Charlotte Anne King Asycue ..... Garner
Mary Dantzler Chambliss ..... Greensboro
Julia Lee Martin ..... Zebulon

Degrees Conferred December 19, 1990

Meredith Carolyn Carle ..... Durham
Harriet Loy Fletcher ..... Goldsboro
Lisa May Jefferys ..... Youngsville

Educational Administration and Supervision

Degrees Conferred August 7, 1990

Faye Cox Gaines ..... Newton Grove
Trudi Mae Lacey ..... Tampa, FL
Terry Jon Weakley ..... Cottage Grove, MN

Guidance and Personnel Services

Degrees Conferred August 7, 1990

Louise Pottinger Eiswirth ..... Raleigh
Ricardo Ambrosio Parodi ..... Los Angeles, CA
Sarah Kathryn Shutt ..... Roanoke Rapids

Degrees Conferred December 19, 1990

Melinda Jones Bissett ..... Raleigh

Health Occupations Teacher Education

Degrees Conferred December 19, 1990

Nancy Lynn Burkhart ..... Charleston, SC
Pamela Staples Kirks ..... Raleigh
Brenda Efland Long ..... Roxboro
Sara Johnson Switzer ..... Raleigh

Mathematics Education

Degrees Conferred August 7, 1990

Mary Allison Bradley ..... Greensboro
Phyllis Edwards Danskin ..... Rocky Mount
Eileen Dunn Williams ..... Rochester, MN

Middle Grades Education

Degree Conferred August 7, 1990

Lynda Marley Summerlin ..... Durham

Degrees Conferred December 19, 1990

Delores Wooten Fogg ..... Raleigh

Science Education

Degrees Conferred August 7, 1990

Arthur Leslie Langley ..... Louisburg
Gregory Thomas Morris ..... Wilson

Special Education

Degrees Conferred August 7, 1990

Sandra Marie Aliff ..... Raleigh
Lesley Henry Facello ..... Wilmington
Denise Bynum Jackson ..... Raleigh
Kathryn Bethea O'Meallie Launey ..... Raleigh
Mary Alice McIntosh ..... Charlotte
Virginia Thompson Smith ..... Apex
Tammy Laureen Stamper ..... Winston-Salem
Anne Bryan Williams ..... Greensboro

Degrees Conferred December 19, 1990

Sondra Finklea Brown ..... Raleigh
Ann Price Finley ..... Raleigh
Michelle Elnora Steed ..... Raleigh

Training and Development

Degrees Conferred December 19, 1990

Marguerite Clark Curtis ..... Wilmington
Sarah Marcia Williams Harris ..... Raleigh

MASTER OF ENGINEERING

Degree Conferred August 7, 1990

Dempsey Bailey Brewer, Jr. ..... East End

Degrees Conferred December 19, 1990

Joseph Charles Anthony ..... Cary
Marcia Lynn Doubet ..... Fuquay-Varina
Joseph Daniel Long ..... Greensboro

MASTER OF FORESTRY

Degree Conferred August 7, 1990

Mark Harllee Powell ..... Raleigh

MASTER OF INTEGRATED MANUFACTURING SYSTEMS ENGINEERING

Degrees Conferred August 7, 1990

Steffen Michael Fohn ..... Ludwigsinfen, West Germany
Carlos Jose Gonzalez-Miranda ..... Mayaguez, Puerto Rico
Barbara Joann Hurley ..... Whispering Pines
Chalamaiah N. Madipalli ..... Nidadavolu, India
Martin Eric Reeder ..... Winston-Salem
Pang-Min Wang ..... Taipei, Taiwan, Republic of China

Degrees Conferred December 19, 1990

Wenliang Honng ..... Taipei, Taiwan, Republic of China
Diana Cecilia Silva Ledezma ..... Monterrey, Mexico
Chau Minh Tran ..... Raeford

MASTER OF LANDSCAPE ARCHITECTURE

Degrees Conferred December 19, 1990

Buddy Allen Franklin ..... Graham
Margaret Newsome Jones ..... Efland

MASTER OF LIFE SCIENCES

Degrees Conferred December 19, 1990

Terrence Michael Callahan ..... Utica, NY
Duy Nguyen Huynh ..... Raleigh
Michael Thomas Pilato ..... Raleigh

MASTER OF MECHANICAL ENGINEERING

Degree Conferred August 7, 1990

Lee Allen Barger ..... Newton

Degrees Conferred December 19, 1990

Wade Henderson Berkebile ..... Hartsville, SC

MASTER OF NUCLEAR ENGINEERING

Degree Conferred August 7, 1990

Kevin Stanford Beard ..... Buies Creek

Degrees Conferred December 19, 1990

Raymond Herbert Voss ..... Farmington Hills, MI

MASTER OF PRODUCT DESIGN

Degrees Conferred August 7, 1990

Oscar Luis Arce ..... San Jose, Costa Rica
Vita Lynn Jones ..... Seattle, WA
Michael Blair Ligon ..... Blair, SC

Degrees Conferred December 19, 1990

Rodney William Morton ..... Elm City

MASTER OF PUBLIC AFFAIRS

Degrees Conferred August 7, 1990

Alta Marie Perry ..... Detroit, MI
Lisa Pleasant Price ..... Wendell
Paul Christian Ridgeway ..... Raleigh
Bradley Kirk Smith ..... Mount Holly

Degrees Conferred December 19, 1990

Steven Randall Gardner ..... Morganton
Stephen Craig Morrisette ..... Cary
Ramon Terry Revilla ..... Williamston

MASTER OF RECREATION RESOURCES ADMINISTRATION

Degrees Conferred August 7, 1990

*Helene Blumenauer McCullough ..... Brentwood, NY
Kimberly Dawn Phillips ..... Greenville

Degrees Conferred December 19, 1990

Deborah Lee Hancock ..... Raleigh

MASTER OF STATISTICS

Degrees Conferred December 19, 1990

Amanda Beth Haas ..... Hudson
Judith Nilmini Jayawickrama ..... Colombo, Sri Lanka
Louise Adelle Johnson ..... Bertand, NE
Rose Marie Martinez ..... Jacksonville

MASTER OF TEXTILES

Degrees Conferred December 19, 1990

Richard Oliver Brown ..... Greensboro
Mark Stuart Carlough ..... Concord
Hayim Sorin Cohen ..... Tel-Aviv, Israel
Wiryanto Sumaryo ..... Bandung, Indonesia

*(Co-major: Public Affairs)

MASTER OF ARTS DEGREES

Archival Management

Degrees Conferred December 19, 1990

Susan Ann Robbins ..... Angier
Linda Anne Spencer ..... Cary

English

Degrees Conferred August 9, 1989

Erik Albert Bledsoe ..... Asheboro
Emily Preston Bond ..... Independence, VA
George Arthur Cox, Jr. ..... Brownsville, TX
Thomas Edward Gould ..... Oakland, NJ
Shirley Ann Meehan ..... Raleigh
Kevin James Norris ..... Goldsboro
John Leslie Owen ..... Saxapahaw
Janyce Elaine Riess ..... Raleigh
Teresa Ann Taylor ..... Kinston
Bobby Michael Watts ..... Taylorsville

Degrees Conferred December 19, 1990

Carol Elizabeth Scovil Brinkley ..... Chapel Hill
Michael Leon Watson ..... New Bern

History

Degree Conferred August 7, 1990

Pamela Robinson Hunter ..... Nashville

Degrees Conferred December 19, 1990

William Michael Gray ..... Raleigh

Liberal Studies

Degrees Conferred August 7, 1990

William Speller Smith, Jr. ..... Raleigh
Linda Gail Ramstack ..... Utica, MI

MASTER OF SCIENCE DEGREES

Adult and Community College Education

Degree Conferred August 7, 1990

Robert Milton Stivender ..... Angier

Degrees Conferred December 19, 1990

Mary Elizabeth Fanning ..... Chapel Hill

Aerospace Engineering

Degrees Conferred August 7, 1990

Steven Howard Frankel ..... Dix Hills, NY
John Richard Gardiner ..... Wilmington, DE
Marc William Kniskern ..... Upper Marlboro, MD
John Landon Meyer ..... Raleigh
Leslie Lamonte Weaver, Jr. ..... Chester, VA

Degrees Conferred December 19, 1990

Kevin Cunningham ..... Columbus
Jack Ray Edwards, Jr. ..... Eden
Basil Hassan ..... Raleigh
Douglas James Hudson ..... Raleigh
James Donald Packard ..... Opelika, AL
Graham Scott Rhodes ..... Smithfield
James Edward Weger ..... Chuqiak, AK

Animal Science

Degree Conferred August 7, 1990

Steven Brooks Cabell ..... Tarboro

Agricultural Economics

Degrees Conferred December 19, 1990

Frank Harris Belcher Kruse ..... Carrollton, MO
Mary Ann Martin ..... Camden, SC

Biochemistry

Degree Conferred August 7, 1990

Charles Meacham Harrell ..... Burgaw

Biological and Agricultural Engineering

Degrees Conferred August 7, 1990

Edward MacDonald Barnes ..... Pisgah Forest
Alicia Lee Lanier ..... Clarkton

Degrees Conferred December 19, 1990

Sidney Hunter Deck ..... Greensboro

Chemical Engineering

Degrees Conferred August 7, 1990

Janice Lorrie Marshall ..... Marlboro, NJ
Christopher Neil Provan ..... Kingston, Jamaica

Degrees Conferred December 19, 1990

David Robert Zint ..... Alexandria, KY

Chemistry

Degrees Conferred August 7, 1990

Gail Hartmann Webster ..... Raleigh
Joseph Conrad Sloop ..... Lillington

Degrees Conferred December 19, 1990

Chungrhim Kim ..... Seoul, Korea
Daniel Lee Woodard ..... Spring Hope

Civil Engineering

Degrees Conferred August 7, 1990

James Lloyd Douglass ..... Poquoson, VA
Wael Mazen Elseaidy ..... Raleigh

Darlene Desiree Kozub ..... Jamestown, NY
Marija Perisic ..... Belgrade, Yugoslavia

Degrees Conferred December 19, 1990

David Scott Harshman ..... Fairfax, VA
James Darrin Holt ..... Sanford
Melchor Pulido Mallare, Jr. ..... Marion, AL
James Fredrick Mehnert ..... Kansas City, KS
Donald Lee Moss, Jr. ..... Pilot Mountain
James Harvey Trogdon III ..... Hope Mills

Computer Engineering

Degrees Conferred August 7, 1990

Arun Anantharaman ..... Bangalore, India
Victor Minta Chen ..... St. Paul, MN
Teresa Abi-Nader Dahlberg ..... Uniontown, PA
Carl Thomas Gray ..... Forest, MS
Tse-I Kuo ..... Kaohsiung, Taiwan, Republic of China
Geetha N. K. Rangan ..... Bangalore, India

Degrees Conferred December 19, 1990

Lawrence Alan Cawley ..... Springfield, IL
Hwei-Ling Chen ..... Cha-Yi, Taiwan, Republic of China
Philip John Christensen ..... Raleigh
Susan Ann Huber ..... Raleigh
David Michael Wisnoski ..... Fort Worth, TX

Computer Science

Degrees Conferred August 7, 1990

Kimon Panayotis Kontovassilis ..... Athens, Greece
Seng Fuat Ou ..... Singapore
Markus Goetz Siegle ..... Stuttgart, West Germany
Mary Beth Smith ..... Charlotte
John Timothy Terrell ..... High Point

Degrees Conferred December 19, 1990

Larry Carson Bennett ..... Muncie, IN
Pei-Tsung Chiu ..... Taoynan, Taiwan, Republic of China
Gregory Lee DeHoogh ..... Raleigh
Ravinder Devarajan ..... Madras, India
Sherman Bruce Gibbons ..... Raleigh
Sarah Beth Hall ..... Raleigh
Louis Leon Harrison ..... Philadelphia, PA
Taha Khedro ..... Aleppo, Syria
Amit Sanyal ..... New Delhi, India
Chien Dinh Vu ..... Saigon, Vietnam

Crop Science

Degrees Conferred August 7, 1990

Lackson Chisambiro ..... Lilongwe, Malawi
Janet Lea Marth ..... Bourbonnais, IL
Steven Boyd Moye ..... Goldsboro

Degrees Conferred December 19, 1990

Ellen Susan Blenk ..... Exeter, NH
Myron Ossie Fountain ..... Richlands

Dennis Donald Moorman ..... St. Maurice, IN
Setyo Dwi Utomo ..... Bandar Lampung, Indonesia

Ecology

Degrees Conferred December 19, 1990

Mary Kay Clark ..... Elizabethtown

Electrical Engineering

Degrees Conferred August 7, 1990

Hanmant Pramod Belgal ..... Pune, India
Alexander Richard Dalal ..... Rockville, MD
Gary Wayne Dawson ..... Raleigh
Mihail Devetsikiotis-Hadjinicolaou ..... Thessaloniki, Greece
Ronald Albert Kuhn ..... Damascus, MD
Jerry Michael Reid ..... Winston-Salem
William Mark Treat ..... Durham

Degrees Conferred December 19, 1990

Hayssam Mohamed Alsous ..... Durham
Robert Floyd Benningfield, Jr. ..... Winston-Salem
Jeffrey Owen Chandler ..... Raleigh
Douglas Harold Cox ..... Raleigh
Kevin Lee Cureton ..... College Station, TX
Victor Joseph Duvanenko ..... Indianapolis, IN
Agustín Fernandez-León ..... Madrid, Spain
David Eugene Graybeal ..... Blacksburg, VA
Douglas Ticknor Grider ..... Ruston, LA
Gihan Moustafa Karmous ..... Raleigh
Thomas Paul Karnowski ..... Knoxville, TN
Peter Marshall Mangum ..... Raleigh
Jacqueline Draper Parrish ..... Raleigh
James Douglas Patterson ..... Raleigh
Robert Yaeger Peters, Jr. ..... Greensboro
Brian Earle Purvis ..... Bennett
Daniel Roy Winkelstein ..... Pittsburgh, PA
Frederick Evans Reed ..... Naperville, IL
Xiaowei Ren ..... Beijing, People's Republic of China
Herbert Rivera-Sánchez ..... Carolina, Puerto Rico
Frederick Peter Symonds ..... Knoxville, TN
Robert Peter Vaudo ..... Somerville, MA

Entomology

Degrees Conferred December 19, 1990

Lisa Joyce Wimpfheimer ..... Westfield, NJ

Forestry

Degrees Conferred December 19, 1990

Michael Vernon Campbell ..... Woodbridge, VA
Sung-Min Cho ..... Seoul, Korea
Jeffrey Kevin Donahue ..... Evansville, IN
Timothy Paul Stewart ..... Raleigh

Genetics

Degree Conferred August 7, 1990

Tina Ruth Logsdon ..... Cary

Horticultural Science

Degree Conferred August 7, 1990

Joseph Michael Kemble ..... Pine Hill, NJ

Degrees Conferred December 19, 1990

Rachelle Allison Fong ..... Sacramento, CA
Sharon Rebecca Funderburk ..... Monroe

Industrial Engineering

Degrees Conferred August 7, 1990

Nathan Kevin Howie ..... Fayetteville
Rohinton Minoo Karanjia ..... Bombay, India
Brian Kent Spiro ..... Raleigh

Degrees Conferred December 19, 1990

Steven Douglas Hepler ..... Lewisville
Vee Chong Lee ..... Melaka, Malaysia
Jhong Sik Oh ..... Seoul, Korea
Michael David Lush Walsh ..... Goldsboro
Sadras Anandavel Senthilvel ..... Madras, India

Management

Degrees Conferred August 7, 1990

Alan Leonard Crowle ..... Raleigh
Scott Tran Gordley ..... Greensboro
Marwan Salah Juma ..... Amman, Jordan
Elzbieta Maria McElroy ..... Warsaw, Poland
Linda Jeneal Melvin ..... Raleigh

Degrees Conferred December 19, 1990

Abdelrahman Kahsai Abdalla ..... Asmara, Ethiopia
Bee Leng Choo ..... Lincoln, NE
Margaret Moss Cooke ..... Raleigh
Melissa Cox ..... Cincinnati, OH
Yeou-Lin Ho ..... Taipei, Taiwan, Republic of China
Ou-Yang Chieh-Chih Jan ..... Taipei, Taiwan, Republic of China
Phani Rani Maddali ..... Vijayawada, India
Michael Wayne Martin ..... Apex
Brian John Saylor ..... Raleigh
Timothy Gene Sproles ..... Dante, VA
Wei-Yiong Wan ..... Denpasar, Indonesia
Handikin Wiryaman Wong ..... Bogor, Indonesia
Qian Zhang ..... Beijing, People's Republic of China

Marine, Earth and Atmospheric Sciences

Degrees Conferred August 7, 1990

Mark John Burzinski ..... Sheboygan, WI
Steven Rice Chiswell ..... Derwood, MD
Ross Eric Elliott ..... Scotia, NY
George Jeffrey Gower ..... Raleigh
William Lewis Schmithorst, Jr. ..... Raleigh
Kenneth Steven Smith ..... Howell, NJ

Degrees Conferred December 19, 1990

Deugsoo Kim ..... Seoul, Korea
Zheng Li ..... Beijing, People's Republic of China
Anuradha B. Murthy ..... Raleigh
John Thomas Roth ..... Golden Valley, MN

Materials Science and Engineering

Degrees Conferred August 7, 1990

William Joseph Dauksher ..... Point Lookout, NY
Katherine Dodds Stonnington ..... Reston, VA
Fang Zhang ..... Beijing, People's Republic of China

Degrees Conferred December 19, 1990

Michael Tristan Andreas ..... Charlotte
Wei Gu ..... Beijing, People's Republic of China
Mary Longo ..... Dalton, MA
Giuseppe Matera ..... Rome, Italy

Mathematics

Degree Conferred August 7, 1990

Arthur Groves Moore ..... Raleigh

Mathematics (Applied)

Degrees Conferred August 7, 1990

Gregor Anthony Hoghe ..... Albany, NY
Elizabeth Sherrod Jones ..... Raleigh
Wyatt Alexander Mangum ..... Richmond, VA
Mary Beth McDaniel ..... Cary
Neil Phillip Sigmon ..... Newton

Degrees Conferred December 19, 1990

Susan Yancey Dresser ..... Rocky Mount
Jun Ren ..... Beijing, People's Republic of China

Mechanical Engineering

Degrees Conferred August 7, 1990

Stephen Bryan Austin ..... Garner
Her Chang Ay ..... Taoyun, Taiwan, Republic of China
Joseph William Hough ..... Washington, DC
Jae Yung Kim ..... Greensboro
Byron Franklin Knight ..... Tallahassee, FL
Louis Paul Oligee ..... Louisville, KY
Robert Norman Sharpe III ..... Greensboro

Degrees Conferred December 19, 1990

Shounak Mahhusudan Athavale ..... Pune, India
Eric Geoffrey Blough ..... Fayetteville
Chih-Chun Cheng ..... Nantou, Taiwan, Republic of China
Douglas Albert Hodgson ..... Cary
Charles Robert Lewis ..... Statesville
Ellen Frances West ..... Cary
Joseph DeWitt Regan ..... Raleigh
William Earl Russell II ..... Swansboro
Robert Gerard Sember ..... Ulster Park, NY

Microbiology

Degrees Conferred August 7, 1990

Shermalyn Rebecca Greene ..... Efland
Kenneth Mark Wiencek ..... Winston-Salem
Karen Motsinger Young ..... Lexington

Degrees Conferred December 19, 1990

Seh-Ching Lin ..... Taichung, Taiwan, Republic of China
Sheela Irene MacDougal ..... Port Jefferson, NY

Nuclear Engineering

Degrees Conferred December 19, 1990

Ala Fayez Al-Zaben ..... Haifa, Palestine

Nutrition

Degrees Conferred December 19, 1990

Silvia Elena Buntinx ..... Mexico City, Mexico

Operations Research

Degrees Conferred August 7, 1990

Matthew John Beattie ..... Rockville, MD
Alan Richard Chappell ..... Newport News, VA

Physics

Degrees Conferred August 7, 1990

Claes Hakan Bjorkman ..... Stockholm, Sweden
Steven Mark Kolins ..... Steven's Point, WI

Degrees Conferred December 19, 1990

Raymond Patrick Burns ..... Cleveland, OH
Christopher Douglas Keith ..... Murphy
David Allen Moffett ..... Dallas

Physiology

Degrees Conferred December 19, 1990

Donna Leanne Neldon-Ortiz ..... Bakersfield, CA

Plant Pathology

Degrees Conferred December 19, 1990

Nenad Filajdic ..... Belgrade, Yugoslavia
Phuong Bui Nguyen ..... Blountville, TN

Psychology

Degrees Conferred August 7, 1990

Thomas Ainsworth Jones ..... Williamsport, PA
Michael John Rothemich ..... Brookneal, VA

Degrees Conferred December 19, 1990

Lisanne Rae Shupe ..... Okemos, MI
Diane Ursone ..... Philadelphia, PA

Rural Sociology

Degrees Conferred December 19, 1990

Sara Reynolds Curran ..... Raleigh
Beth Lynn Davison ..... Lenoir
Jody Michelle Greene ..... Rockingham

Science Education

Degree Conferred August 7, 1990

Linda Rose Mueller ..... Endwell, NY

Technical Communication

Degree Conferred August 7, 1990

Norma Jean Terrell ..... Raleigh

Textile Chemistry

Degree Conferred August 7, 1990

Tod Alan Madderra ..... Fort Walton Beach, FL

Degrees Conferred December 19, 1990

Shohreh Parandoosh ..... Tehran, Iran

Textiles

Degrees Conferred August 7, 1990

Cheol-Jae Hong ..... Seoul, Korea
Sung Hoon Jeong ..... Seoul, Korea
Keith Fleming Morrison ..... Rockingham
Patricia Gause Terrien ..... Owego, NY

Degrees Conferred December 19, 1990

Daniel Lee Cagle ..... Claremont
Larry Charles Dickinson ..... Hickory
Bhupesh Dua ..... New Delhi, India
Fiona Jane Leek ..... Crawley, Sussex, England
Candido Pichardo ..... San Pedro de Macoris, Dominican Republic
Martha Lambeth Poindexter ..... Raleigh

Veterinary Medical Sciences

Degrees Conferred December 19, 1990

Morella De Rosa ..... Caracas, Venezuela

Wildlife Biology

Degrees Conferred December 19, 1990

Bret Daniel Wallingford ..... Reeders, PA

Wood and Paper Science

Degrees Conferred December 19, 1990

Yong Sung Oh ..... Seoul, Korea

Zoology

Degrees Conferred August 7, 1990

Carole Kathleen Copeyon ..... Wyoming, MI
Renee Hodgden ..... Durham
Jacqueline Jean Lape ..... Springfield, OH

Degrees Conferred December 19, 1990

Wanda Carol Williams ..... Durham

Doctor of Education Degrees

Degrees Conferred August 7, 1990

Susan Perry Gurganus, Curriculum and Instruction
Raleigh, North Carolina
Dissertation: A Comparison of Special Education and Regular Education Teachers' Views on Performance Appraisal as Measured by National Performance and Evaluation Standards. (Under the direction of Cathy L. Crossland and Bettye MacPhail-Wilcox.)

Janice Styons Hall, Guidance and Personnel Services
Raleigh, North Carolina
Dissertation: The Developmental Effects of a Peer Counseling Program for High School Students. (Under the direction of Edwin R. Gerler, Jr.)

Degrees Conferred December 19, 1990

Henry Louis Johnson, Educational Administration and Supervision
Raleigh, North Carolina
Dissertation: The Relationship among Track, Type of Courses and Number of Courses That Students Take in High School, Grade Point Average, the North Carolina Minimum Competency Test, and the Scholastic Aptitute Test. (Under the direction of Carl J. Dolce.)

John Howard McKnight, Educational Administration and Supervision
Greenville, North Carolina
Dissertation: The Gradient Cohort-survival Method: A Refinement of the Ratio Forecasting Method for Determining School District Enrollments. (Under the direction of Raymond G. Taylor and Bettye MacPhail-Wilcox.)

Eleanor Janice Morgan, Guidance and Personnel Services
Wilmington, North Carolina
Dissertation: The Relationship of Moral Development of Dyadic Communication Behaviors. (Under the direction of Debie D. Saidla and Norman A. Sprinthall.)

John Mark Pettitt, Adult and Community College Education
Hillsborough, North Carolina
Dissertation: An Evaluation of the National 4-H Executive Development Institute. (Under the direction of Richard T. Liles and R. David Mustian.)

Felix Andrew Rowe, Jr., Adult and Community College Education
Warsaw, North Carolina
Dissertation: The Relationship between Reading Ability and Academic Achievement for Associate Degree Students at a North Carolina Community College. (Under the direction of R. David Mustian.)

Donald Broughton Street, Adult and Community College Education
Nashville, North Carolina
Dissertation: Relationships between Enrollment Changes and Program Marketing Methods in North Carolina Community Colleges, 1982 and 1986. (Under the direction of Benjamin E. Fountain and Ronald W. Shearon.)

Betty Lou Wooten, Adult and Community College Education
Lumberton, North Carolina
Dissertation: Determinants of the Comfort Level of African American Students in North Carolina Community Colleges. (Under the direction of Laura I. Rendon and Ronald W. Shearon.)

Janet Marie Young, Guidance and Personnel Services
Raleigh, North Carolina
Dissertation: Conceptual Level and Intellectual Growth of Students Enrolled in Freshman Seminar. (Under the direction of Norman A. Sprinthall.)

Doctor of Philosophy Degrees

Degrees Conferred August 7, 1990

Trip Alihamsyah, Biological and Agricultural Engineering
Pamekasan, Indonesia
Dissertation: Development and Evaluation of Techniques for On-the-go Soil Mechanical Impedance Measurements. (Under the direction of Ervin G. Humphries.)

Mahdy Ismeel AlJazzaf, Operations Research
Kuwait, Kuwait
Dissertation: Multiplier Methods with Partial Elimination of Constraints for Nonlinear Programming. (Under the direction of Joseph C. Dunn.)

Michael Aloysius Arnold, Horticultural Science
Zanesville, Ohio
Dissertation: Chilling Enhancement of New Root Growth in Species of *Malus*. (Under the direction of Eric Young.)

Walter John Bentley III, Biological and Agricultural Engineering
Nashville, Tennessee
Dissertation: Effects of Hydraulic Conductivity and Entrance Resistance on Drainage Processes. (Under the direction R. Wayne Skaggs.)

Christine Louise Bergmark. Soil Science
Raleigh, North Carolina
Dissertation: Differential Inhibition by Ferulic Acid on Net Nitrate, Ammonium and Potassium Uptake by *Zea mays* L. (Under the direction of William A. Jackson.)

Nicholas Biunno, Materials Science and Engineering
Bellville, Florida
Dissertation: Laser Processing of Nitrides and Carbides of Titanium and Semiconducting Thin Films. (Under the direction of Jagdish Narayan.)

Blair Buckley III, Horticultural Science
New Madrid, Missouri
Dissertation: Occurrence of Stem Blight Resistance in Blueberry. (Under the direction of James R. Ballington.)

Yung-Chang Frank Chin, Wood and Paper Science
Taipei, Taiwan, Republic of China
Dissertation: Low Chlorine Bleaching of Bagasse Soda-AQ Pulp and Non-chlorine Bleaching of Kraft Southern Pine Pulp. (Under the direction of Hou-min Chang.)

Jae Jeong Cho, Fiber and Polymer Science
Seoul, Korea
Dissertation: Rheological Behavior and Coagulation of Anisotropic Solutions of Cellulose in the NH_3/NH_4SCN System. (Under the direction of John A. Cuculo and Michael H. Theil.)

Chulsup Chung, Mechanical Engineering
Seoul, Korea
Dissertation: Thermal Stress and Free-edge Stress Singularities in Bimaterial Structures. (Under the direction of Jeffrey W. Eischen.)

Vanla Dittapongpitch, Plant Pathology
Khon Kaen, Thailand
Dissertation: Analysis of Plasmids in North Carolina Strains of Phytopathogenic Bacterium *Xanthomonas campestris* pathovar *vesicatoria* and the Role of Miniplasmids in Decreased Sensitivity to Copper and Streptomycin Sulfate. (Under the direction of Jeng-sheng Huang and David F. Ritchie.)

William Wesley Edmonson, Electrical Engineering
Detroit, Mitchigan
Dissertation: Stochastic State Space Modeling from Canonical Correlation Analysis. (Under the direction of Winser E. Alexander.)

Johari Bin Endan, Biological and Agricultural Engineering
Kluang, Malaysia
Dissertation: Simulation of Corn Earworm Damage in PEANUT. (Under the direction of James H. Young.)

Marisa Rezenda Fontes, Soil Science
Vicosa, Brazil
Dissertation: Interactions of Goethite and Humic Acid in Some Oxisols from Brazil. (Under the direction of Sterling B. Weed.)

Audrey Lynn Goodell, Biochemistry
Altoona, Pennsylvania
Dissertation: Investigation of the Possible Role of Sulfhydryl Oxidase Activity in the Assembly of Immunoglobulin M. (Under the direction of H. Robert Horton.)

Jun Cheol Han, Mathematics
Pusan, Korea
Dissertation: Involutions in Left Artinian Rings. (Under the direction of Kwangil Koh.)

Harish Pura Hiriyannaiah, Electrical Engineering
Bangalore, India
Dissertation: Signal Reconstruction Using Mean Field Annealing. (Under the direction of Sarah A. Rajala and Wesley E. Snyder.)

Brinton Alden Hopkins, Nutrition
Lewes, Delaware
Dissertation: Effect of Intraperitoneal Infusion of L-leucine, L-isoleucine, L-valine and L-arginine on Alleviation of Milk Fat Depression in Early Lactation Holstein Dairy Cows. (Under the direction of Allen H. Rakes.)

James Richard Hunter, Chemical Engineering
Greenville, South Carolina
Dissertation: Radiotracer Studies of Protein Adsorption at the Air/Water Interface. (Under the direction of Ruben G. Carbonell and Peter K. Kilpatrick.)

Douglas James, Applied Mathematics
Colorado Springs, Colorado
Dissertation: Conjugate Gradient Methods for Constrained Least Squares Problems. (Under the direction of Carl D. Meyer and Robert J. Plemmons.)

Leon Stacy Jernigan, Jr., Botany
Garner, North Carolina
Dissertation: Factors Influencing the Distributional Patterns of *Juncus roemerianus* in North Carolina Salt Marshes. (Under the direction of Ernest D. Seneca.)

Sivand Lakmazaheri, Civil Engineering
Raleigh, North Carolina
Dissertation: A Study on the Constraint Logic Approach for Structural Design Automation. (Under the direction of Ajaya K. Gupta and William J. Rasdorf.)

Stephen Chris Landers, Zoology
Norfolk, Nebraska
Dissertation: The Ultrastructure and Histochemistry of Cyst Formation in the Apostome Ciliate *Hyalophysa chattoni.* (Under the direction of Phyllis C. Bradbury.)

Bih-Hwang Lee, Computer Engineering
Taipei, Taiwan, Republic of China
Dissertation: Performance Analysis of the Finite Buffer Systems. (Under the direction of Arne A. Nilsson.)

Clinton Beauregard Lee, Electrical Engineering
Farmville, Virginia
Dissertation: Electrical Properties and Devices of Laser Deposited High-T_c Superconducting Thin Films. (Under the direction of Jagdish Narayan and Jimmie J. Wortman.)

Wei Li, Fiber and Polymer Science
Shanghai, People's Republic of China
Dissertation: On the Structural Mechanics of 3-D Braided Preforms for Composites. (Under the direction of Aly Ely E1-Shiekh.)

Stephen Frank Mader, Forestry
New York, New York
Dissertation: Recovery of Ecosystem Functions and Plant Community Structure by Tupelo—Cypress Wetland Following Timber Harvesting. (Under the direction of Russ Lea.)

Patti Murphy Manning, Psychology
Raleigh, North Carolina
Dissertation: The Relationship of Self-concept, Sex-role Orientation and Locus of Control between Female Athletes and Non-athletes with Futher Investigation of Birth Order, Commitment and Influencing Agent among the Athletes. (Under the direction of Patricia F. Horan.)

Youssef Mohammad-zadeh, Mechanical Engineering
Exton, Pennsylvania
Dissertation: Experimental and Mathematical Analysis of Three Ground Coupled Heat Exchangers. (Under the direction of Richard R. Johnson.)

Kay Marie Moneyhun, Mathematics
Oak Ridge, Tennessee
Dissertation: Isoclinisms in Lie Algebras. (Under the direction of Ernest L. Stitzinger.)

Carl Edwin Motsenbocker, Horticultural Science
Cary, North Carolina
Dissertation: The Identification and Basis of Herbicide Tolerance in Sweetpotato Germplasm. (Under the direction of Thomas J. Monaco.)

Kassem Moustafa Mourad, Mechanical Engineering
Cairo, Egypt
Dissertation: The Application of the Boundary Element Method to Predict the Response of a Differential Operator Model for a Coupled Viscoelastic-Acoustic System. (Under the direction of Larry H. Royster.)

Nancy Jeanne O'Connor, Marine, Earth and Atmospheric Sciences
Raleigh, North Carolina
Dissertation: Larval Settlement and Juvenile Recruitment in Fiddler Crab Populations. (Under the direction of Thomas G. Wolcott.)

Kyoung Wan Park, Physics
Seoul, Korea
Dissertation: A Study of Surface Interaction with Native Oxides and Insular Deposition on GaAs. (Under the direction of Gerald Lucovsky.)

Carolyn Antoinette Prince, Horticultural Science
Bennettsville, South Carolina
Dissertation: Studies on the Growth Responses of Bell Pepper to N Rate and N:K Ratios. (Under the direction of Douglas C. Sanders.)

James Wesley Rideout, Soil Science
Stony Creek, Virginia
Dissertation: Mechanisms and Management of Premature Flowering in Flue-cured Tobacco. (Under the direction of Gordon S. Miner and C. David Raper.)

Marcos Antonio Eduardo Santana, Wood and Paper Science
Brasilia, Brazil
Dissertation: Separation of Glucuronic Acid from Sweetgum (*Liquidambar styraciflua* L.) Wood Prehydrolyzates. (Under the direction of Irving S. Goldstein.)

Randall James Schadt, Physics
Kearney, Nebraska
Dissertation: An Investigation of Microstructural Changes in Acrylate-type Copolymers Due to Photolytic/Acid Pollutant Degradation Using ^{13}C CP/MAS NMR. (Under the direction of Raymond E. Fornes and Richard D. Gilbert.)

James Davidson Seabolt, Economics
Greensboro, North Carolina
Dissertation: Regulation of U. S. Local Distribution Company to End-user Retail Natural Gas Sales: Are All Consumer Classes Treated Equally? (Under the direction of Edward W. Erickson and Walter N. Thurman.)

Michael Anthony Shirley, Marine, Earth and Atmospheric Sciences
Providence, Rhode Island
Dissertation: Habitat Selection by Molting and Mating Blue Crabs, *Callinectes sapidus* (Rathbun). (Under the direction of Thomas G. Wolcott.)

Cheryl Marie Stroud, Veterinary Medical Sciences
Apex, North Carolina
Dissertation: Steroid Modulation of Gonadotrophin Releasing Hormone—induced Luteinizing Hormone Release in Diestrous and Anestrous Pigs: In vitro Characterization. (Under the direction of Gary D. Dial and Edouard V. DeBuysscher.)

Thomas Craig Williams, Psychology
Haw River, North Carolina
Dissertation: The Effect of Trainee Attributes on Rater Training Effectiveness and the Relationship between Manager-Supervisor Rating Error. (Under the direction of Paul W. Thayer.)

James Lee Willit, Chemistry
Glen Ellyn, Illinois
Dissertation: Redox Kinetics and Thermodynamics of Strongly Absorbed Cytochrome c on Tin Oxide Electrodes. (Under the direction of Edmond F. Bowden and Dennis Wertz.)

Mark Edward Zarnstorff, Crop Science
Raleigh, North Carolina
Dissertation: Physio-ecological Effects of Cultural and Pesticide Management on No-till Establishment of Switchgrass and Seed Dormancy. (Under the direction of Douglas S. Chamblee.)

Degrees Conferred December 19, 1990

Bruce Louis Ahrendsen, Economics
Olin, Iowa
Dissertation: Optimal Capital Structure for the Proprietary Firm: An Empirical Analysis of North Carolina Dairy Farms. (Under the direction of Robert N. Collender and Richard K. Perrin.)

Naazar Ali, Crop Science
Faisalabad, Pakistan
Dissertation: Inheritance of Early Maturity and Dormancy in Peanut (*Arachis hypogaea* L.). (Under the direction of Johnny C. Wynne.)

Khalid Mohamed Al-Otaibi, Nuclear Engineering
Jeddah, Saudi Arabia
Dissertation: Mechanical Anisotropy, Strain Aging and Deformation Mechanisms in Zirconium and Zirconium-Niobium Alloys. (Under the direction of K. Linga Murty.)

David Ray Anderson, Botany
Raleigh, North Carolina
Dissertation: Procedures for Improved Somatic Embryo Maturation in Norway Spruce (*Picea abies*). (Under the direction of Ralph C. Mott.)

Miguel Angel Ara, Soil Science
Pucallpa, Peru
Dissertation: Nitrogen Contribution of the Legume to Grazed Pastures in the Humid Tropics. (Under the direction of Pedro A. Sanchez.)

John Robert Ashburn, Physics
Olin, Iowa
Dissertation: Measurements of H (n=3) Density Matrices for 20 to 150 keV H^+ on He. (Under the direction of John S. Risley.)

M. K. Augustine, Mathematics
Ramapurang, India
Dissertation: Monoids of Lie Type and Their Congruences. (Under the direction of Mohan S. Putcha.)

Claudio Emilio Balocchi, Forestry
Valdivia, Chile
Dissertation: Age Trends of Genetic Parameters and Selection Efficiency for Loblolly Pine (*Pinus taeda* L.). (Under the direction of Floyd E. Bridgwater and Bruce J. Zobel.)

Elsworth Douglas Beach, Economics
Houston, Texas
Dissertation: A Hedonic Analysis of Herbicides: Does Safety Matter. (Under the direction of Gerald A. Carlson.)

Kurt Evan Borg, Physiology
Minden, Nebraska
Dissertation: Endocrine and Behavioral Responses of the Bull, Boar and Ram at the Time of Mating. (Under the direction of Kenneth L. Esbenshade.)

Michael Doyle Boyette, Biological & Agricultural Engineering
Wendell, North Carolina
Dissertation: Increasing the Energy Efficiency of Icemaking by Continuous Solidification and Hydraulic Harvesting. (Under the direction of Roger P. Rohrbach.)

Gary Wayne Brester, Economics
Laurel, Montana
Dissertation: Effects of Measurement Error in Disappearance Data on Estimated Demand Elasticities for Meat. (Under the direction of Michael K. Wohlgenant.)

Holly Marie Brown-Borg, Physiology
Omaha, Nebraska
Dissertation: Influence of the Sympathetic Nervous System on Immune Responses in the Chick and Isolation of an Embryonic Nerve Growth—promoting Protein. (Under the direction of Frank W. Edens.)

Ann Barbara Carlson, Aerospace Engineering
Yorktown, Virginia
Dissertation: Direct Simulation Monte Carlo with Ionization and Radiation. (Under the direction of Hassan A. Hassan.)

Glenda Stephens Carter, Science Education
Raleigh, North Carolina
Dissertation: The Effect of External Verbalization by Fifth Graders in the Development of Lever Concepts. (Under the direction of Norman D. Anderson and John C. Park.)

Mark Edwin Casada, Biological and Agricultural Engineering
Lexington, Kentucky
Dissertation: Simulation of Heat Transfer and Moisture Migration during Transportation of Shelled Peanuts. (Under the direction of James H. Young.)

Chao-Ren Chang, Electrical Engineering
Taipei, Taiwan, Republic of China
Dissertation: Computer-aided Analysis of Nonlinear Microwave Analog Circuits Using Frequency-domain Spectral Balance. (Under the direction of Michael B. Steer.)

Yeon-Pun Chang, Mechanical Engineering
Taipei, Taiwan, Republic of China
Dissertation: Single and Collective Bubble Dynamics in the Cavitating Flow over an Ogive Body. (Under the direction of James C. Mulligan.)

Yong Jun Cho, Civil Engineering
Seoul, Korea
Dissertation: Statistical Properties of Nonlinear Random Waves. (Under the direction of Chi C. Tung.)

Joosang Chung, Forestry
Seoul, Korea
Dissertation: Neural Network Applications to Forest Stand Stocking Control. (Under the direction of Joseph P. Roise.)

John Brittain Cooper, Chemistry
Charleston, South Carolina
Dissertation: Spectroelectrochemical Studies of Ruthenium Diimine Complexes. (Under the direction of Dennis W. Wertz.)

Karen Lynn Core, Mechanical Engineering
Raleigh, North Carolina
Dissertation: Heat Transfer and Population Characteristics in Multiphase Dispersed Media with Phase Change. (Under the direction of James C. Mulligan.)

Eleanor Hawkins Cwirko, Chemical Engineering
Catonsville, Maryland
Dissertation: Electrolyte Transport in Charged Membranes. (Under the direction of Rubin G. Carbonell.)

Orlando Monteiro Da Silva, Economics
Viçosa, Brazil
Dissertation: The International Market for Frozen Concentrated Orange Juice—Prospects for Brazil. (Under the direction of John C. Dutton, Jr.)

Donald Lee Deal, Jr., Horticultural Science
Raleigh, North Carolina
Dissertation: High Night Temperature Tolerance Zones. Modeling, Predicting and Investigating the Effects of High Night Temperatures on Ornamental Plant Adaptation. (Under the direction of August A. DeHertogh and James C. Raulston.)

Douglas James Doohan, Horticultural Science
Truro, Nova Scotia, Canada
Dissertation: Field Violet (*Viola arvensis* Murr.) Biology, Management in Strawberries (*Fragaria x ananassa* Duchesne) and Basis for Herbicide Tolerance. (Under the direction of Thomas J. Monaco and Thomas J. Sheets.)

William Stephen Dvorak, Forestry
Raleigh, North Carolina
Dissertation: Genetic Variation in Root Morphology of Four Mexican Pine Species. (Under the direction of Charles B. Davey.)

Randi Wilfert Eckel, Entomology
Wilmington, Delaware
Dissertation: Epidemiological Relationships between Aphids and Tobacco Etch Virus in Tobacco. (Under the direction of Emmett P. Lampert and George G. Kennedy.)

Nagwa Mahmoud ElShaik, Mechanical Engineering
Pullman, Washington
Dissertation: Direct Contact Heat Transfer to a Dispersed Droplet with Change of Phase. (Under the direction of James C. Mulligan.)

José Luzardo Estrada-Lopez, Animal Science
Bogota, Colombia
Dissertation: Effect of Insulin-like Growth Factor-1 on Protein Synthesis in Porcine Embryonic Discs Cultured in Vitro. (Under the direction of Robert M. Petters.)

Richard Lee Gaffney, Jr., Aerospace Engineering
Fayetteville, North Carolina
Dissertation: An Abbreviated Reynolds Stress Turbulence Model for Airfoil Flows: (Under the direction of Hassan A. Hassan.)

Amotz Joseph Geshury, Fiber and Polymer Science
Ramat-Gan, Israel
Dissertation: Effect of the Simultaneous Application of Heat and Dynamic Mechanical Forces on the Thermal Protective Performance of Aramid Fabrics. (Under the direction of Roger L. Barker and Wallace P. Behnke.)

Avinash Laxman Ghirnikar, Electrical Engineering
Bombay, India
Dissertation: An Inverse QR Recursive Least Squares Algorithm for Adaptive Filtering. (Under the direction of S. Thomas Alexander.)

Dan Owen Harris, Electrical Engineering
Madisonville, Kentucky
Dissertation: Acousto-Optic Photonic Switching. (Under the direction of Anthony VanderLugt.)

Majid Mahmoud Hashemi, Electrical Engineering
Tehran, Iran
Dissertation: Fabrication, Characterization and Modeling of Non-alloyed FET Structures by ALE. (Under the direction of Salah M. Bedair.)

Wei-Hwa Her, Chemical Engineering
Yungho, Taiwan, Republic of China
Dissertation: Platinized Nafion Membrane: Electrode Structure, Fabrication and Application in Gas Phase Hydrocarbon Hydrogenation and Oxidation Reactions. (Under the direction of Peter S. Fedkiw.)
George Lawrence Hodge, Industrial Engineering
Raleigh, North Carolina
Dissertation: Decision Models for Evaluating Apparel Manufacturing Work Cells. (Under the direction of John R. Canada.)

Robert Grove Hollingsworth, Entomology
Raleigh, North Carolina
Dissertation: Influence of the Balsam Woolly Adelgid (Homoptera: Adelgidae) on Fraser Fir Growth, Bark Structure and Abnormal Wood Production. (Under the direction of Fred P. Hain.)

Roger Michael Hoy, Biological and Agricultural Engineering
Suffield, Connecticut
Dissertation: Design of a Near Infrared Interferometer and the Direct Use of Interferograms for Chemical Analysis. (Under the direction of W. Fred McClure.)

Gwo-Ming Jan, Operations Research
Taipei, Taiwan, Republic of China
Dissertation: A New Variant of the Primal Affine Scaling Algorithm for Linear Programs. (Under the direction of Shu-Cherng Fang.)

Jongwhan Jang, Electrical Engineering
Seoul, Korea
Dissertation: Texture Segmentation-based Image Coder Incorporating Properties of the Human Visual System. (Under the direction of Sarah A. Rajala.)

Keith John Jones, Plant Pathology
Tewkesbury, England
Dissertation: Components of Resistance in *Nicotiana tabacum* to *Phytophthora parasitica* var. *nicotianae*. (Under the direction of Larry F. Grand and H. David Shew.)

Magdy Abdelwahab Kassem, Materials Science and Engineering
Kalubia, Egypt
Dissertation: Effect of Interstitial Elements on Phase Stability of Selected Intermetallics. (Under the direction of Carl C. Koch.)

Chang Tien Kiang, Fiber and Polymer Science
Sao Paulo, Brazil
Dissertation: The Influence of Polymer Characteristics and Melt Spinning Conditions on the Production of Fine Denier Poly(ethylene Terephthalate) Fibers. (Under the direction of John A. Cuculo.)

Gary Jay Kirkpatrick, Marine, Earth and Atmospheric Science
Bradfordwoods, Pennsylvania
Dissertation: An Underwater Instrument to Measure Photosynthetic Response of Phytoplankton Exposed to Natural Light Fluctuation. (Under the direction of Daniel Kamykowski.)

Gregorio Leandro Madrigal, Plant Pathology
Alajuela, Costa Rica
Dissertation: Survival of *Pseudomonas solanacearum* in Soil, Rotation Crops and Debris and Penetration and Infection of Susceptible and Resistant Tobacco Cultivars. (Under the direction of Eddie Echandi and Robert G. Upchurch.)

Heuisuck Lee, Nutrition
Seoul, Korea
Dissertation: Nutritional Evaluation of Overcooked Soybean Meal in Poultry. (Under the direction of Jim D. Garlich.)

Jung-Hee Lee, Electrical Engineering
Tae Gu, Korea
Dissertation: Carrier Collection and Laser Properties in Monolayer-thick Quantum-well Heterostructures Grown by Molecular Beam Epitaxy. (Under the direction of Robert M. Kolbas.)

Yong Hee Lee, Materials Science and Engineering
Daegu, Korea
Dissertation: Bias and Substrate Effects on the Vapor Phase Growth of Diamond Thin Films. (Under the direction of Klaus J. Bachmann and Jeffrey T. Glass.)

Vincent Pernell Lewis, Zoology
Lancaster, South Carolina
Dissertation: An Evaluation of the Diet of Atlantic Menhaden, (*Brevoortia tyrannus*), and Its Nutritional Value, with Particular Emphasis on the Contribution of Amorphous Detritus. (Under the direction of John M. Miller and David S. Peters.)

Chon-Yie Lin, Fiber and Polymer Science
Kaohsiung, Taiwan, Republic of China
Dissertation: Poly(ethylene Terephthalate) Melt Spinning Via Controlled Threadline Dynamics. (Under the direction of John A. Cuculo and Paul A. Tucker.)

Deborah Sue Loer, Genetics
Cottage Grove, Minnesota
Dissertation: Chromatin Structure and Gene Expression in Plants. (Under the direction of Steven L. Spiker and William F. Thompson.)

Shaun Timothy Love, Computer Science
Durham, North Carolina
Dissertation: Nonholographic, Autostereoscopic, Nonplanar Display of Computer Generated Images. (Under the direction of David F. McAllister.)

Eric Meyer Martin, Chemistry
Raleigh, North Carolina
Dissertation: Synthesis and Characterization of Late Transition Metal Complexes of $[N_2S_2]^{2-}$ Ligand Systems. (Under the direction of Robert D. Bereman.)

LeRoy Brown Martin III, Chemistry
Raleigh, North Carolina
Dissertation: Mass Spectrometry of Organometallics and Platinated Oligonucleotides. (Under the direction of Anton F. Schreiner and Richard B. van Breeman.)

Thomas Hanson Martin, Zoology
Dickerson County, Virginia
Dissertation: Direct and Indirect Effects of Fish Predation on Freshwater Littoral Benthos. (Under the direction of Larry B. Crowder.)

Gerald Ray McCrain, Forestry
Asheville, North Carolina
Dissertation: Habitat Evaluation Procedures (HEP) Applied to Mitigation Banking in North Carolina. (Under the direction of Arthur W. Cooper and David A. Adams.)

Brian Thomas McDermott, Materials Science and Engineering
Stem, North Carolina
Dissertation: Application of Atomic Layer Epitaxy to the Growth of III-V Compounds. (Under the direction of Salah M. Bedair and Nadia A. ElMasry.)

Stanley Anderson McIntosh, Fiber and Polymer Science
Mount Holly, North Carolina
Dissertation: Structure and Photolytic Properties of Azo Dyes. (Under the direction of Harold S. Freeman.)

Kristen Louise Meier, Statistics
Millersville, Pennsylvania
Dissertation: Estimating Rate Equations Using Nonparametric Methods. (Under the direction of Douglas W. Nychka.)

Dennis Lee Mengel, Soil Science
York, Pennsylvania
Dissertation: Site Preparation Techniques to Improve Soil Infiltration, Water-holding Capacity and Bulk Density, and Shoot Growth of *Bombacopsis quinata* in Colombian Plantations on Vertic Soils. (Under the direction of Charles B. Davey.)

Thomas James Miller, Zoology
London, England
Dissertation: Body Size and the Ontogeny of Feeding in Fishes. (Under the direction of Larry B. Crowder.)

Roma Ballabh Mohanti, Nuclear Engineering
New Delhi, India
Dissertation: Time Dependent Numerical Simulation of Nonideal Plasmas in Ablation Controlled Arcs. (Under the direction of John G. Gilligan.)

Paul David Orkwis, Aerospace Engineering
Raleigh, North Carolina
Dissertation: A Newton's Method Solver for the Two-dimensional and Axisymmetric Navier-Stokes Equations. (Under the direction of D. Scott McRae.)

Balasubramania Panchapakesan, Wood and Paper Science
Madras, India
Dissertation: Photoinduced Reactions of Lignin and Lignin Degradation Products: Photo-oxidation of Chlorinated Organics in Bleach Plant Effluents; Photoinduced Reactions of Lignin in High Yield Pulps. (Under the direction of Josef S. Gratzl.)

James Campbell Posey, Jr., Fiber and Polymer Science
Greensboro, North Carolina
Dissertation: An Approach to the Design of Lightfast Disperse Dyes. (Under the direction of Harold S. Freeman.)

Jinshu Qiu, Soil Science
Ninghai, People's Republic of China
Dissertation: Effects of Phosphorus Deficiency on Carbon and Nitrogen Assimilation and Utilization in Whole Soybean Plants. (Under the direction of Daniel W. Israel.)

Dorcas June Robb, Psychology
Raleigh, North Carolina
Dissertation: Social Support in Incarcerated Females. (Under the direction of Denis O. Gray and James E. R. Luginbuhl.)

David Clifford Robinson, Civil Engineering
Raleigh, North Carolina
Dissertation: Development of a Level of Service Indicator for Ferry Services. (Under the direction of Paul D. Cribbins.)

Tong-Min Sa, Soil Science
Seoul, Korea
Dissertation: Effects of Phosphrous Deficiency on Energy Status and Functioning of Soybean Nodules. (Under the direction of Daniel W. Israel.)

Carole Haemmerle Saravitz, Horticultural Science
Durham, North Carolina
Dissertation: In vitro Propagation of Fraser Fir (*Abies fraseri*) and Virginia Pine (*Pinus virginiana*) from Embryonic Explants. (Under the direction of Henry V. Amerson and Frank A. Blazich.)

Philip James Schoeneberger, Soil Science
Perham, Minnesota
Dissertation: Physical Properties and Water Movement through a Soil and Saprolite at Different Geomorphic Positions. (Under the direction of Aziz Amoozegar and Stanley W. Buol.)

Zlatko Sitar, Materials Science and Engineering
Ljubljana, Yugoslavia
Dissertation: Growth and Characterization of III-V Nitride Thin Films. (Under the direction of Robert F. Davis.)

John Cooke Smeltzer, Chemical Engineering
Silver Spring, Maryland
Dissertation: Periodic Cell-voltage Control of a Parallel-plate Reactor: Metal Deposit Distribution and Selectivity Enhancement for the Reduction of Nitrobenzene. (Under the direction of Peter S. Fedkiw.)

Craig Allan Smith, Physiology
Shell Lake, Wisconsin
Dissertation: Inhibitory Effects of Estradiol-17B on Luteinizing Hormone Release in Female Swine. (Under the direction of Glen W. Almond and Kenneth L. Esbenshade.)

Stephen Allen Smith, Veterinary Medical Sciences
Marietta, Ohio
Dissertation: The Immune Response of Blue Tilapia, *Oreochromis aureus*, to the Parasitic Dinoflagellate, *Amyloodinium ocellatum*. (Under the direction of Edward J. Noga and Michael G. Levy.)

Lawrence Steven Solomon, Sociology
Charlotte, North Carolina
Dissertation: Manufactured Housing and the Elderly: Residential Satisfaction, the Sense of Community, Social Integration and Psychological Adjustment. (Under the direction of Randall J. Thomson.)

Mark Gordon Stinson, Electrical Engineering
St. Louis, Missouri
Dissertation: The Influence of Ion Radiation on Perimeter Degradation in Thin-oxide Devices. (Under the direction of Carlton M. Osburn.)

Yunbao Sun, Wood and Paper Science
Nanjing, People's Republic of China
Dissertation: Dechlorination and Decolorization of Chlorolignins in Bleach Plant Effluents by Ultrafiltration, Oxygen Oxidation and Biological Treatment Processes. (Under the direction of Hou-min Chang and Thomas W. Joyce.)

Eiji Suzuki, Chemical Engineering
Tokyo, Japan
Dissertation: Kinetics of Monoclonal Antibody Production. (Under the direction of David F. Ollis.)

Andrew VanSickle Talmadge, Applied Mathematics
Jonesboro, Arkansas
Dissertation: A Geometric Formulation of the Higgs Mechanism via Internal Metric Fields. (Under the direction of Ronald O. Fulp.)

William Jennings Terrell, Mathematics
Raleigh, North Carolina
Dissertation: Observability and External Description of Linear Time Varying Singular Control Systems. (Under the direction of Stephen L. Campbell.)

Kim Elizabeth Tripp, Horticultural Science
Huntington, New York
Dissertation: Physiological Aspects of Tomato Foliar Deformation at Elevated CO_2 Concentration. (Under the direction of Mary M. Peet and David M. Pharr.)

Thomas Mitchell Vess, Chemistry
Raleigh, North Carolina
Dissertation: The Design and Applications of a Spectroelectrochemical Cell Using a Movable Electrode. (Under the direction of Dennis W. Wertz.)

Julia Lurita Whitworth, Horticultural Science
Lamont, Oklahoma
Dissertation: Changes in Carbohydrates and Carbon Dioxide Evolution throughout Winter Rest of Young Apple Trees. (Under the direction of Eric Young.)

Faye Mills Wilhite, Crop Science
Hyattsville, Maryland
Dissertation: Selection and Linkage Investigations in Maternally Derived Doubled Haploid Populations of Tobacco. (Under the direction of Earl A. Wernsman.)

Guangcai Xing, Materials Science and Engineering
Shandong, People's Republic of China
Dissertation: Growth and Characterization of $ZnGeP_2$/GaP Heterostructures by MOCVD and $ZnGeP_2$ Bulk Single Crystals. (Under the direction of Klaus J. Bachmann and John J. Hren.)

Yanan Yu, Biomathematics
Hubei, People's Republic of China
Dissertation: A Leslie Model, Threshold Function and Uncertainty for Chemical Control of Corn Earworm. (Under the direction of Harvey J. Gold.)

Moosa Zand, Mechanical Engineering
Tehran, Iran
Dissertation: Thermal and Non-Newtonian Effects in Elastohydrodynamic Lubrication of Rolling-Sliding Contacts. (Under the direction of Richard R. Johnson.)

UNDERGRADUATE ALUMNI DISTINGUISHED PROFESSORS

Dr. Kenneth L. Esbenshade	Department of Animal Science College of Agriculture and Life Sciences
Dr. Geraldine H. Luginbuhl	Department of Microbiology College of Agriculture and Life Sciences
Dr. James N. Nau	Department of Civil Engineering College of Engineering
Dr. Richard R. Patty	Department of Physics College of Physical and Mathematical Sciences
Dr. Ernest L. Stitzinger	Department of Mathematics College of Physical and Mathematical Sciences
Dr. Roger M. Warren	Department of Parks, Recreation and Tourism Management College of Forest Resources

GRADUATE ALUMNI DISTINGUISHED PROFESSORS

Dr. Hassan A. Hassan	Department of Mechanical and Aerospaee Engineering College of Engineering
Dr. R. Wayne Skaggs	Department of Biological and Agricultural Engineering College of Agriculture and Life Sciences

OUTSTANDING TEACHERS FOR 1990-91

Name	*Department and College*
Ash, Sarah L.	Animal Science Agriculture & Life Sciences
Benson, Ray B., Jr.	Materials Science & Engineering Engineering
Canada, John R.	Industrial Engineering Engineering
Carbonell, Ruben G.	Chemical Engineering Engineering
DeJoy, Daniel A.	Communication Humanities & Social Sciences
Hansen, Arthur P.	Food Science Agriculture & Life Sciences
Harper, Charles W.	Curriculum & Instruction Education & Psychology
Hooker, Will E.	Horticultural Science Agriculture & Life Sciences
Jameel, Hasan	Wood & Paper Science College of Forest Resources
Leach, James W.	Mechanical & Aerospace Engineering Engineering
Levine, Samuel G.	Chemistry Physical & Mathematical Sciences
Mock, Gary N.	Textile Engineering, Chemistry, & Science Textiles
Moncol, Daniel J.	Microbiology, Pathology, & Parasitology Veterinary Medicine
Park, John C.	Mathematics & Science Education Education & Psychology
Reynolds, Stephen P.	Physics Physical & Mathematical Sciences
Skender, Charles J.	Accounting Humanities & Social Sciences
Taylor, E. Wayne	Design Design
Turner, Lynn G.	Food Science Agriculture & Life Sciences
VanderKam, James C.	Philosophy & Religion Humanities & Social Sciences

Awards for Achievement 1990-1991

COLLEGE OF AGRICULTURE AND LIFE SCIENCES

Agri-Life Council Outstanding Club Member Awards:
African American Science and Health Society: Kathy I. Kenney, Richmond, VA
Agronomy: Thomas J. Boyce, Edenton
Animal Science: Kenneth L. Howe, Gastonia
Biochemistry: Ellen Maria Williams, Raleigh
Biological and Agricultural Engineering: Science Curriculum—William C. Dunn, Winterville; Technology Curriculum—Darrell T. Westmoreland, Winston-Salem
Agricultural and Resource Economics: Christopher W. Grimes, Roper
Food Science: Bruce W. Hein, Winston-Salem
Horticultural Science: Mickey B. Wynne, Stokes
Microbiology: Jayeshkumar V. Patel, Greensboro
National Agri-Marketing Association: Ladd W. Whicker, Winston-Salem
NCSU Collegiate 4-H Club: Jason Harrell, Hertford
Poultry Science: Derek D. Baucom, Monroe
Pre-Medical and Pre-Dental: David A. Thompson, Clinton
Pre-Veterinary: Kevin M. Jones, Lincolnton
Wildlife Biology: James C. Turner, Sanford

Agronomy
Senior Highest Scholastic Average in Agronomy: Troy E. Coggins, Denton
American Society of Agronomy Award, Most Outstanding Senior: Troy E. Coggins, Denton
Agronomy Club Leadership Award: Thomas J. Boyce, Edenton

Animal Science
Most Outstanding Club Member: Sharon L. Bass, Lucama
Most Outstanding Senior: John E. Ellis, Old Fort
Most Outstanding New Club Member: Elizabeth A. Thomas, New Bern
Outstanding Senior in Animal Science: Kenneth L. Howe, Gastonia
American Society of Animal Science Undergraduate Awards: Stephanie J. Anderson, Whitakers; Katherine A. Benson, Siler City; Melanie L. Blackard, Semora; Christine J. Campbell, Lewisville; Staci H. Canterberry, Cary; Scott R. Chandler, Mt. Gilead; Cheryl D. Cheves, Bunn; Patricia A. Evans, Manchester, NH; Christine D. Hannaway, Fairfax, VA; Crystal J. Kirby, Lucama; Laurie A. Lang, Kernersville; Bridgett C. Mitchell, Greensboro; Stacy K. Myers, Raleigh; Susan M. Noftsger, Shelby; Jennifer A. Rudisill, Stanley; Georgia L. Schoenberger, Candor; Christy R. Stone, Laurinburg; Danny L. Wright, Polkton

Biochemistry
Outstanding Biochemistry Student Awards: Michael K. Gibson, Raleigh; Stephen L. Perkins, Lillington
The American Institute of Chemists Foundation Outstanding Biochemistry Student Award 1991: Edward C. Schatte, Raleigh

Biological and Agricultural Engineering
American Society of Agricultural Engineers, Student Honors Awards—North Carolina Student Engineering Branch of the American Society of Agricultural Engineers: Steven E. Lawing, Charlotte
North Carolina Student Mechanization Branch of the American Society of Agricultural Engineers: Paul G. Penninger, Lexington

Botany
Most Outstanding Student: Milo Pyne, Durham

Food Science

B. M. Newell Award: Keith E. Petrofsky, Raleigh

Forbes Leadership Award: John S. Roberts, Newton

Ambrosia Chocolate Top Scholar Award: Carolyn F. Roff, Raleigh

Leonard & Francis Crouch Scholastic Achievement Award: Carol M. Tompkins, Springfield, VA

Horticultural Science

Outstanding Senior Horticulturist Award: Albert R. Cooke, Pittsboro

Microbiology

Most Outstanding Students: Kathy G. Meyer, Faison; Edward C. Schatte, Garner; Robert C. Wilkens, Sterling, VA

Poultry Science

T. T. Brown Poultry Science Club Award: Eddie D. Gore, Sneads Ferry

Zoology

Most Outstanding Student: Robert C. Wilkins, Sterling, VA

SCHOOL OF DESIGN

ARCHITECTURE AWARDS

The American Institute of Architects Henry Adams Medal: Criteria: scholastic achievement, character, and promise of professional ability. *Epifanio L. Pazienza*

The American Institute of Architects Henry Adams Certificate of Merit: Criteria: scholastic achievement, character, and promise of professional ability. *James E. Gordon*

North Carolina Chapter of The American Institute of Architects Award for Design Achievement: Criteria: greatest promise in design by a Master of Architecture degree recipient. *Epifanio L. Pazienza*

Richard Green Award for Design Achievement: Criteria: greatest promise in design by a Bachelor of Architecture degree recipient. *Jeffrey Frank Harkey*

Architecture Faculty Award for Design Achievement: Criteria: greatest promise in design by a Bachelor of Environmental Design/Architecture degree recipient. *Jacqueline M. McNaney* and *Dean Landon Young*

Alpha Rho Chi Medal: Criteria: ability for leadership . . . willing service to his or her school . . . and program . . . promise of real professional merit through attitude and personality. *Bronald Clay Johnson*

Walter Hook Award: Criteria: appreciation for and creative application of technology in architecture. *Jerry Darrell Fink*

DESIGN AWARD

Design Faculty Book Award: Criteria: Outstanding academic achievement and design excellence in the Department of Design. *Susanne Hupp Adams*

LANDSCAPE ARCHITECTURE AWARDS

Landscape Architecture Faculty Honor Award: Criteria: outstanding academic performance and design excellence in Landscape Architecture. *Anderson Cooke Hensley*

Landscape Architecture Faculty Service Award: Criteria: for dedicated service in support of faculty and students in the Department of Landscape Architecture. *John Daniel Roberts (in absentia)*

Landscape Architecture Faculty Book Award: Criteria: Total scholastic performance and professional promise. *Susan L. Gular*

PRODUCT/VISUAL DESIGN AWARDS

Product Design Book Awards: Criteria: scholastic achievement in Product Design. *Mitchell Warren* (Undergraduate), *Steven Slaton, Vincent Haley* (Graduate)

Product Design Outstanding Graduate Teaching Assistant Award: Vincent Haley

Industrial Designers Society of America Student Merit Award: Criteria: outstanding Graduate in Product Design. *David Banko*

Outstanding Undergraduate in Visual Design Book Awards: Criteria: scholastic achievement in Visual Design. *Chong Un Kim*

Outstanding Graduate in Visual Design Book Award: Criteria: scholastic achievement in Visual Design. *Kathleen O'Toole*

COLLEGE OF EDUCATION AND PSYCHOLOGY

Education Council Outstanding Senior Awards:
Agricultural Education: Georgena Ann Barefoot, Dunn
Health Occupations Teacher Education: Connie T. McCullen, Princeton
Marketing Education for Teachers: Sharon Eugenia Irving, Wilmington
Mathematics Education: Christina Geracoulis, Wakefield, MA
Middle Grades Language Arts and Social Studies: Leah Farriba, Garner
Psychology (outstanding graduating senior): Michael Todd Allen, Ramseur
Psychology (general option): Alice Faulkner Pettyjohn, Raleigh
Psychology (human resource development option): Diana Rie Mason, Youngsville
Science Education: Rhonda Joan Hampton, Wake Forest
Technology Education: Janet Woody Carter, McLeansville

Agricultural Education Awards to Most Outstanding Seniors:
Fall 1990: Johnny Douglas Weaver, Jr., Middlesex
Spring 1991: Donna Lee Koontz, Lexington
Durwin M. Hanson Achievement Award: Donna Lee Koontz, Raleigh
Epsilon Pi Tau-Leadership Award: Allan Thomas Hamrick, Morganton
Mathematics Education, Outstanding Teaching Assistant: Sarah Elizabeth McManus, Spring Lake
Mathematics Education Service Award to Outstanding Teacher: Carolyn Peebles
Psychology Department Award for Service to the Department: Tracy Lynn Field, Atlanta, GA
Psychology Department Award for Academic Achievement: John Walter Philbeck, Raleigh
Psychology Department Award for Research: Katherine Joyce Follett, Cary
Science Education Service Award to Outstanding Teacher: Tonya Hancock

COLLEGE OF ENGINEERING

Engineering Senior Award for Scholarly Achievement: Patrick W. Canupp, Clemmons (Mechanical and Aerospace Engineering)

Engineering Senior Award for Citizenship and Service: Lisa Renee Goss, Durham (Electrical and Computer Engineering)

Engineering Senior Award for Leadership: Gwen Elaine Clark, Durham (Materials Science and Engineering)

Engineering Senior Award for the Humanities: Amy Jo Troutman, Annandale, VA (Electrical and Computer Engineering)

Biological and Agricultural Engineering

Agri-Life Council Outstanding Club Member Award for Biological and Agricultural Engineering: Science Curriculum: William Carlyle Dunn, Winterville

American Society of Agricultural Engineers Student Honor Award: North Carolina Student Engineering Branch of ASAE: Steven Eric Lawing, Charlotte

Chemical Engineering

Outstanding Contribution to Chemical Engineering Department: Fred C. Samz, Fletcher

NSDEA Graduate Fellowship: Gavin Gaynor

Outstanding Teaching Assistant Award: Michael S. McCutchen
Dow Student Achievement Award: Rahesh Bakshi
Electo-Chemical Society Award: John W. Weidner
Dow Teaching Fellowship: Edward J. Wolfrum
NSF Award: Nancy J. Lynch

Civil Engineering
ASCE Outstanding Award: Charles M. Marshall, Fayetteville
Nominees: Carolyn E. Hignutt, Jamestown; John T. Jenkins, II, Greenville; Joseph C. Hines, Rice, VA
Associated General Contractors Award to Outstanding Senior in Civil Engineering/Construction Option: David Lee Stout, Sanford
Outstanding Teaching Assistant Awards: David Frederick Weymann, Raleigh; Shiuh-Liang Yan, Tamsui, Taiwan
ASCE NC Section Scholarship Award: Pamela Lynn Alexander, Raleigh
Panhellenic Outstanding Women's Award: Pamela Lynn Alexander, Raleigh; Carolyn E. Hignutt, Jamestown

Computer Science
Scholarly Achievement: Savon S. Gay, Wendell
Citizenship and Service: Larnell Lennon, Raleigh
Humanities: Lorraine Mercer, Cary
Leadership: Steven R. Jones, Raleigh

Electrical and Computer Engineering
Awards To Be Announced

Furniture Manufacturing and Management
Rudolph Willard Award, Outstanding Senior in Furniture Manufacturing and Management: Rhonda Leigh Isaac, Maiden

Industrial Engineering
Outstanding Industrial Engineering Student: James David Sebring, Jr., Hampton, VA

Materials Science and Engineering
Outstanding Senior Award: Robert T. Leonard, Greer, SC
Mrs. L. P. Doshi Scholarship: Gwen E. Clark, Durham
John A. Boren Merit Scholarship: Stephen C. Kokenes, Charlotte
Alcoa Merit Scholarship: Christina S. Wixson, Gastonia
National Science Foundation Engineering Research Center for Advanced Electronic Materials Processing, Undergraduate Scholar Award: Gwen E. Clark, Durham; William B. Muir, Wilmington; Paul M. Verghese, Raleigh; Christina S. Wixson, Gastonia

Mechanical and Aerospace Engineering
ASME Outstanding Student Member: Eric Alston, Sanford
Charles T. Main Award for Region IV of ASME: Eric Alston, Nominee for 1990-91, Sanford
AIAA President's Certificate: Patrick W. Canupp, Clemmons

COLLEGE OF FOREST RESOURCES

Forestry
Biltmore Work Scholarships: David P. Blevins, Langley AFB, VA; Stephen M. Daniels, Greensboro; James W. Overby, High Point; Robert D. Sturgill, Newport; Phillip E. Whitlow, Brookneal, VA

James L. Goodwin Work Scholarships: David Lane, Raleigh; Kiersten List, Louisville, KY; Thomas Margo, Greenville, SC; Michael Petruncio, Oaklyn, NJ; Jamie Shern, Rockville, MD; Paula Troxell, Pittsburgh, PA

George K. Slocum Work Scholarship: Cheryl Case, Kenneth City, FL; Chalmers Johnson, Charlotte; William C. Johnson, II, Morganton; James Shern, Rockville, MD; Richard Shutt, Ellerbe; Paula Troxell, Pittsburgh, PA; Michi C. Vojta, Naperville, IL

Ralph C. Bryant Scholarship: Chris Carpenter, Chapel Hill; Ivan Evans, Fayetteville

Edwin F. Conger Academic Scholarship: Edward Liverman, Roanoke Rapids; James N. Slye, Mocksville; Kevin Nunnery, Chapel Hill

John M. and Sally Blalock Beard Academic Scholarship: Richard A. Crouse, Roanoke Rapids; Bradley C. Duckworth, Roanoke Rapids; Christopher B. Edgar, Raleigh; Janet L. Millar, Raleigh

Jonathan Wainhouse Memorial Academic Scholarship: Rebecca England, Newland; George Lewis, Reidsville

Hofmann Forest Academic Scholarship: Cheryl Case, Kenneth City, FL; Tim Eudy, Albemarle; Ivan Evans, Fayetteville; Derek E. Halberg, Charlotte; Thomas W. Harrill, Shelby; Giesele Letlough, Greensboro: Johonn A. Mosley, Kinston; Stephanie K. Peeler, Campobello, SC; Henry A. Randolph, Roanoke Rapids; Joanne L. Stumpf, Efland; Bruce White, Durham

Wood and Paper Science

Pulp and Paper Science Technology

Albright & Wilson Americas Inc. Scholarship: Bradford Scott Barron, Raleigh

Mark J. Alexander Scholarship: Jennifer Michelle Parr, Philpot, KY

Alonzo Aldrich Scholarship: Edzel Peter Sarigumba, Brunswick, GA

Dietrich V. Asten Scholarship: Kathryn Lynn Bennett, Wilmington

Betz Laboratories, Inc. Scholarship: Jason Scott Cronin, Tell City, IN

M. Lebby Boinest Scholarship: David Curtis Hasty, Conway

David & Doris Bossen Endowment: Harvey William White, Cary

E.J. & S.W. Brickhouse Scholarship: Scott Douglas Tingle, Kinston

William E. Caldwell Scholarship: Raymond Mark Bass, Vidor, TX

Lawrence H. Camp Scholarship: Edward Allen Turner, Franklin, VA.

Caraustar Industries Scholarship: Eric David Carlson, Cary

J. Robert Carpenter Scholarship: Ronald Douglas Estridge, Raleigh

Cascade Industries Scholarship: Jennifer Elise Todd, Charlotte

Drs. Li-Sho & Lee-Fun Chang Scholarship: Kevin Todd Minnick, Palatka, FL

Terry P. Charbonnier Scholarship: Stephen Edward Bidwell, Charlottesville, VA

Charles W. Coker, Sr. Scholarship: George Edward Stubbins, Mooresville

W. V. Cross & Nalco Scholarships: Timothy Allen Brinker, Palatka, FL

E.E. Ellis Scholarship: John Helem Fullenwider, Lewisport, KY

E.E. Ellis Scholarship: Yen-Ling Lai, Cary

Eric L. Ellwood Scholarship: Nicole Lee Blankenbeckler, Georgetown, SC

John A. Heitmann, III Scholarship: Ku Wilaipun Puangchinda, Savannah, GA

Hercules, Inc. Scholarship: Janice Ruth Cecil, Owensboro, KY

Robert G. Hitchings Scholarship: Lisa Joan Greene, Hawesville, KY

International Paper Co. Scholarship: Cobb Mac Golson, II, Mobile, AL

James River Corporation Scholarship: John Leon Windley, Hayes, VA

Kamine Engineering Scholarship: Gregory James Venditti, Monroe, CT

John R. Kennedy Scholarship: Brian Glen Zehner, Augusta, GA

Will P. Lovin Scholarship: Charles Kevin Haney, Canton

Hazard & Ada May Scholarship: William A. Norris, Wilmington

John M. May, Jr. Scholarship: Wade Edward Rushing, Winston-Salem

Nalco Chemical Co. Scholarship: Chris David Jones, Palatka, FL

George E. Oakley Scholarship: Jason Matthew Huckaby, Charlotte

Sture G. Olsson Scholarship: William Snow Small, James Store, VA

Richard H. Owens Scholarship: Gary Norman Boettcher, Augusta, GA

Paper Chase Scholarship: Karen Genevieve Chipman, Hanover, VA

C. Cline Peters Scholarship: Jerry Michael Floyd, Chadbourn

PIMA-SE Scholarship: Daniel Edwin Pouchot, Achilles, VA

PIMA-Southern Scholarship: Robert Scott Simmons, Ashdown, AR

Rector/Ashcraft Scholarship: Patrick Wayne Low, Rock Hill, SC
Salesmen's Society PIMA Scholarship: Christopher James Hayter, Williamsburg, VA
Harry H. Saunders Scholarship: Dana Kathleen Coale, Brewton, AL
Dr. Fred B. Schelhorn Scholarship: Darryl D. Rasberry, Pine Bluff, AR
Michael Sherman Scholarship: Jeffrey Gordon Thomas, Jamestown
Shouvlin Family Scholarship: Michael Steven Jackson, Shelby
Ray Smith Scholarship: Jennifer D. McCombs, Raleigh
TAPPI Scholarship: Christopher William Blenk, Savannah, GA
TAPPI Scholarship: Robert Glenn McRee, Rome, GA
Dwight Thomson Scholarship: John William Vonnoh, Jr., Yulee, FL
Union Camp Corporation Scholarship: Douglas Frank Falls, Franklin, VA
Vinings Chemical Scholarship: Bradley Lee Evans, Rome, GA
Weyerhaeuser Co. Scholarship: Andrew Anthony Hobson, Asheboro

Wood Products
The Roy Carter Scholarship: Clyde G. Arnette, Jr., Raleigh
Thomas Forshaw Scholarship: Heath G. Saunders, Stanley
Weyerhaeuser Company Scholarships: Anthony A. Amitrano, Chapel Hill; Frederick S. Carter, Jr., McLeansville; Paul W. Westbrook, Raleigh; Ernest O. Youngblood, Franklinton; Robert E. Lewis, Raleigh

Parks, Recreation and Tourism Management
Thomas I. Hines Award—Hallie Sue McCormack

COLLEGE OF HUMANITIES AND SOCIAL SCIENCES

Highest Scholastic Achievement Awards

College of Humanities and Social Sciences: Dorothy Olive Osborne, Stokesdale
Division of Economics and Business:
Department of Accounting: Kevin Lamar Sink, Welcome
Department of Business Management: Erin Kathleen Burton, Sag Harbor, NY
Department of Economics: Thomas Hervey Nunalee, IV, Wilmington
Department of Communication: Thelma Jane Foehl, Holly Springs
Department of English: Dorothy Olive Osborne, Stokesdale
Department of Foreign Languages and Literatures: Melissa Ruth Neal, Cary
Department of History: Harriet Jean Stout, Sanford
Department of Multi-Disciplinary Studies: Betty Davis Byrd, Cary
Department of Philosophy & Religion: Scott Edward Allen, Saint Pauls
Department of Political Science & Public Administration: Karen Frances Castello, Raleigh
Department of Sociology, Anthropology and Social Work: David Carl Hockett (Sociology), Pleasant Garden; Sylvia Louise Mantovani (Social Work), Raleigh
Outstanding Senior Awards: Carla Ann Lucas, Spring Hope; Marisa J. Teleki, Greenville

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

College Awards to Outstanding Seniors
Scholarship: Adam Leonard Lyon, Cary
Leadership: Todd Wesley McMasters, Raleigh
Research: Laura Beth Darien, Simpsonville, SC

Departmental Awards
Chemistry
The North Carolina Institute of Chemists' Outstanding Student Award: Teresa Raye Zuber, Shallotte
The CRC Press Freshman Chemistry Achievement Award: Kimberly Dean Potter, Raeford

The Merck Index Awards for Scholastic Achievement Award: Yvette Darlene Boyajian, Raleigh; Mark Daniel Aldous, Burlington
The 1991 Undergraduate Award in Analytical Chemistry: Wesley Alan Frye, Matthews

Physics
Outstanding Graduating Senior in Physics: Adam Leonard Lyon, Cary
Nancy Chung Freshman Scholarship: Michael Parker Owen, Wilmington
Freshman Physics Studentship: Marcus Darren Smith, Raleigh

Statistics
Outstanding Graduating Senior in Statistics: Laura Erin Kirkland, Lumberton
F. E. McVay Scholarship: Jolee Marie Graham, Murphy
SAS Institute Scholarship: Meredith Carson Dunning, Cary
Mathematics
Outstanding Graduating Senior in Mathematics: Pamela Jane Vehling, St. Paul, MN
John Cell Scholarship: Wendy Ellen Sense, Cary
Mary Alice and Hubert V. Park Scholarship: Pamela Jane Vehling, St. Paul, MN; Adam Guy Fitzgerald, Raleigh
Jack Levine-Charles Anderson Award: Scott Allen Bales, Raleigh
Charles Anderson Scholarship: Christopher Alexander, Charlotte
Charles F. Lewis Scholarship: Mark Robert Sinopoli, Advance
Mrs. Robert C. Bullock Scholarship: Kathy Gale Kannenberg, Raleigh
The Maltbie Award: James Robert Buchanan, Sanford; David M. Mathews, Raleigh
Lowell S. Winton Graduate Award: Tiehong Tian, Raleigh

Marine, Earth and Atmospheric Sciences
Outstanding Graduating Senior in Geology: William Alexander Lumsden, Raleigh
Outstanding Graduating Senior in Meteorology: Richard Neuherz, Cary
Freshman Scholarship in Geology: Clifford Ray McCrary, III, Elkin
Mineralogical Society of America Undergraduate Award: Matthew Zoe-David Cromer, Durham
Outstanding Teaching Assistant, Geology: Steven Arthur Berg, Grifton
Outstanding Teaching Assistant, Meteorology: Robert Anthony Rozumalski, Raleigh

COLLEGE OF TEXTILES

Joseph D. Moore Honor Award: Mary Catherine Coleman, Carolina Beach
Harry Ball Honor Award: Phillip Christopher Craft, Shelby
Lawrence Iason Honor Award: Steven Kinard Benson, Winston-Salem
Chester H. Roth Honor Award: Jennifer Kaye Hrometz, Stoneville
John M. Reeves Scholarship: Dale Arthur Fite, Cherryville
Murray Frumkin Honor Award: Andrea Lynne McNamee, Martinsburgh, WV
Textile Veterans Association Honor Award: Connie Ellen Morton, Albemarle
John E. Reeves Award: Edwin J. Stack, III, Kannapolis
Donald F. McCullough Award: Andy Maurice Barefoot, Jr., Knightdale
John N. Gregg Award: Richard Warren Elmore, Charlotte
American Association of Textile Chemists & Colorists Award: Barbara Jo Stone, Clinton, MD
Phi Psi Textile Fraternity Award: Barbara Jo Stone, Clinton, MD
American Association for Textile Technology Award: Cynthia Ann Johnson, Greensboro
Sigma Tau Sigma Scholarship Fraternity Award:
Kappa Tau Beta Student Leadership Award: George Collins McLarty, High Point
Delta Kappa Phi Textile Fraternity: Sherry Annette Thomas, Pittsboro
AAMA Apparel Student of the Year: Aliza LaFond Diggs, Hampton, VA
Henry A. Rutherford Honorary Award:
The Dean's Award: Frederick Mark Stone, Salisbury

ALUMNI ATHLETIC AWARD

Chris Corchiani

PHI KAPPA PHI
1991 INITIATES

Seniors

Suzanne Hupp Adams
Mark Daniel Aldous
Chris Brian Autry
Peyam Barghassa
Bonnie Lucille Barrett
Mary Esther Blankenship
Yvette D. Boyajian
Betty Davis Byrd
Elena Cano
Josefina Barcia Carpenter
Julianne Carroll
Scott R. Chandler
Ming-Hong Chen
Cynthia Chai Cheng
Aaron Vincent Chew
Cathy Lane Chisholm
Richard Youngho Choi
Leigh Ann Marie Clarke
Paula B. Coates
Barbara A. Crowe
Donna Michelle Daniels
Tamie Carol Daniels
Buffie L. Dew
Aliza L. Diggs
Laura Elisabeth Easter
James Christopher Edmondson, Jr.
Barbara G. Elmore
John Robert Eskew
Linda Felder
Mary Ferebee-Herndon
Alicia Dawn Fisher
Wesley Alan Frye
Jeffrey Allen Funderburk
Stephen Craig Futrell
Cathy Ganey
Rebecca Ann Gorton
Lisa Renee Goss
Christine Danielle Hannaway
Brian Keith Harris
Matthew B. Harris
Sylvia Wilson Harrison
Christine M. Hartzell
Robert W. Hawk
Elizabeth M. Hawley
Frank Brown Hicks, III
Michael P. Hicks
Luke Adam Higgins
Lori Renee Hill
Ryan Andrew Hiss
David C. Hockett
David Morris Honea
Marsha Ann Hughes
Rahiff Fitzgerald Ingle
Cornelia Ellis Jaeger
Kathryn Jarrett
David Patrick Jeans
Erik William Johnson
David Scott Jones
Heloise R. Jones
Kendall Joseph Jones
Sonia Ruth Kaus
Diana Elizabeth Creech Keever
Kristopher William Kemp
Sharon A. Keyes
Sharon Ann King
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Glen A. Malpass
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David Gregg McHenry
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Stephanie Dotson Moore
Alison Meryl Morse
Lydia Moschella
Andrew T. Mueller
Patrick Troy Mullen
Rosemarie J. Murphy
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Tracie D. Otto
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Jin H. Park
Danny Lee Peeler
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Sylvia Piqueras
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Ganesh Subba Rao
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Diane Marie Repp
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Russell Milton Ruckterstuhl
Christian D. Sain
Hans Peter Salzwedel
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Kristi Lea Styers
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Martin L. Tanaka
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Beth Smith Traynham
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Jerry Wayne Vest
David Scott Vinson
Michi Vojta
Ned H. Voorhees
Kathleen A. Wemhoff
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David Rasmussen
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William W. Rolland II
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Tom Tighe
Pamela E. Tobin
Shelly Lynn Vaden, DVM
Radhakrishnan Veerabadran
Gregory N. Washington
Julie Ann Waters
Bobby M. Watts
Michele Murphy Weber
Shou-Cheng Wu

PHI KAPPA PHI ACHIEVEMENT AWARDS

Seniors

Chris B. Autry
Stephanie Denis Ayscue
Patrick W. Canupp
Cynthia Cheng
Tamie Carol Daniels
Mary Thomas Fedewa
Mary Ferebee-Herndon
Adam Guy Fitzgerald
Paul Wade Fulbright
Laila Guessous
Frank Brown Hicks
David Morris Honea
Cornelia Ellis Jaeger
James Joseph Jetter
Brian Alexander Joyner
Adrian Forrest King
Adam Leonard Lyon
Joseph Wilson Monaco
Dorothy O. Osborne
Terry Lee Perkinson
Edward Curtis Schatte
Wendy Faye Seiferheld
Eric Redmund Sharpe
Malinda Leigh Teeters
Michael L. Whittemore
Robert C. Wilkins
Ellen Maria Williams
John Spencer Yoakum
Matthew Sheldon Young

Master's Candidate: Leola K. Henry
Ph.D. Candidate: Michael Abler

NATIONAL PHI KAPPA PHI FELLOWSHIP

Nominee: Susan E. Brooks
Honorable Mentions: Amy Jo Troutman, Michael K. Gibson

GOLDEN CHAIN HONOR SOCIETY INDUCTEES

Senior Class
1990-91

Philip Todd Gray
Mark Howard Hasty
Linda Noel Jones
Katheryn Elizabeth Lee
Stephen Lee Perkins
Leslie Noelle Powell
Michael Jonathan Reece
Kimberly Anne Rogers
Harold Eric Sparks
Ellen Maria Williams
Kimberly Dawn Wood
Angela Paulette Wooten

Army ROTC Commissionees

DECEMBER 1990

Kerwin N. Holden ..... Sylvia
Sarah M. Small ..... Raleigh
Harlan L. South ..... Matoaca, VA

MAY 1991

William C. T. Avery III ..... Greensboro
George L. Coppit III ..... Heidelberg, Germany
Jeffery T. McBroom ..... Smithfield
Matthew C. Richmond ..... Charlotte
Gary M. Russell ..... Franklinton
David A. Thompson ..... Clinton
Elijah Waters V ..... Casar
William F. Yerkes ..... Bel Air, MD

Navy ROTC Commissionees

DECEMBER 1990

Christopher C. Bone ..... Pensacola, FL
William E. Cobb ..... Reidsville
Mark E. Cooney ..... Cary
Edward J. Eder, Jr. ..... Rockville, MD
Michael N. Mantzouris ..... Silver Spring, MD
Robert J. Segelhorst ..... Davidsonville, MD
Richard D. Selland ..... Salisbury, MD
Curtis C. Tucker ..... Grifton

MAY 1991

Albert Randall Baker ..... Claxton, VA
Charles Timothy Benfield ..... Weaverville
Scott Allen Bewley ..... Cary
Eric Eugene Hamilton ..... Brookville, MD
Ralph Timothy Lawrence ..... Asheville
Randall Scott Lesslie ..... Salisbury
Richard John Nortz ..... Harvard, MA

Air Force ROTC Commissionees

DECEMBER 1990

Lance A. Avery ..... Dunn
Douglas J. Martoccia ..... Greenville

MAY 1991

Chad Adam Burel ..... Hillsborough
Jeffery Thomas Cook ..... Charlotte
Eric Paul Critchley ..... Sumter, SC
Mark Williams Johnson ..... Wilmington
Ronald Syke King, Jr. ..... Raleigh
Lida Maria Lisowe ..... Vicenza, Italy
Darren William Rhyne ..... Gastonia
Jeffery Bryne Satterwhite ..... Raleigh
Gregory Scott Walker ..... Waldorf, MD
Patrick J. Weninger ..... Fayetteville
Lawrence E. West ..... Spring Lake

1991 COMMENCEMENT

ACKNOWLEDGEMENTS

The following non-University organizations have contributed significantly to the success of our commencement.

Mr. Frank Greathouse, Owner
Realizations, Inc., Raleigh, N.C.

Design and Implementation
of Stage Backdrop

Mr. Wade C. Miller, Jr., Owner
Sound Engineering, Asheboro, N.C.

Sound Systems

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